IRON TRADE REVIEW AND WESTERN MACHINIST

A JOURNAL OF MANUFACTURES, COMMERCE, INDUSTRY, SCIENCE, ART AND INVENTION.

WEEKLY EDITION VOL. XVII—No. 9 | CLEVELAND, O., MARCH 1, 1884. | MONTHLY EDITION VOL. II—No. 3.

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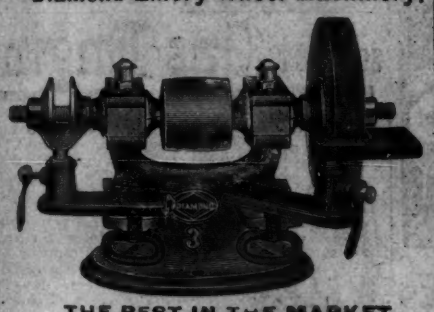

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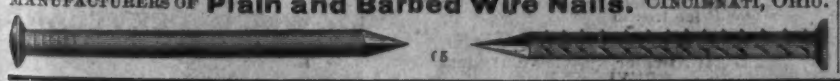

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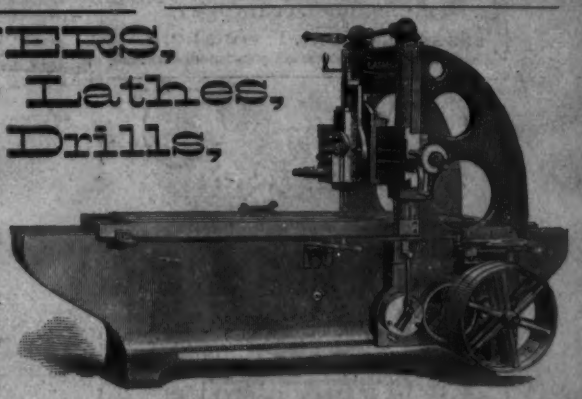

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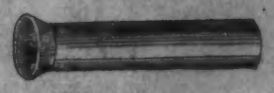

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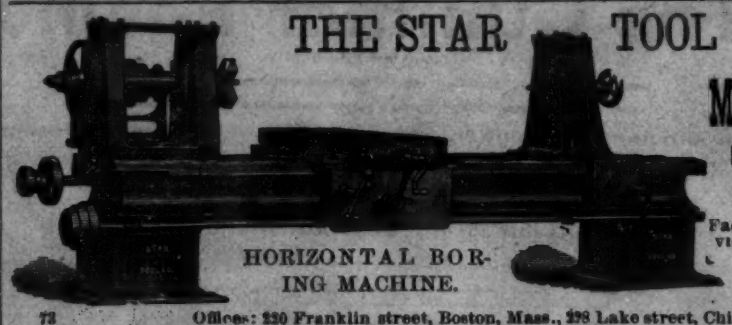

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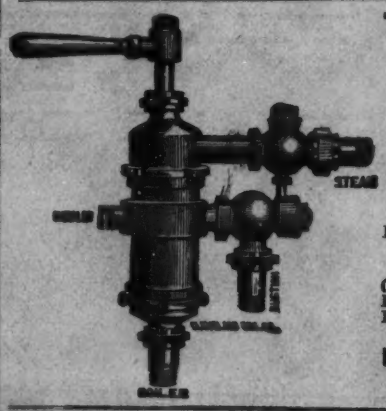

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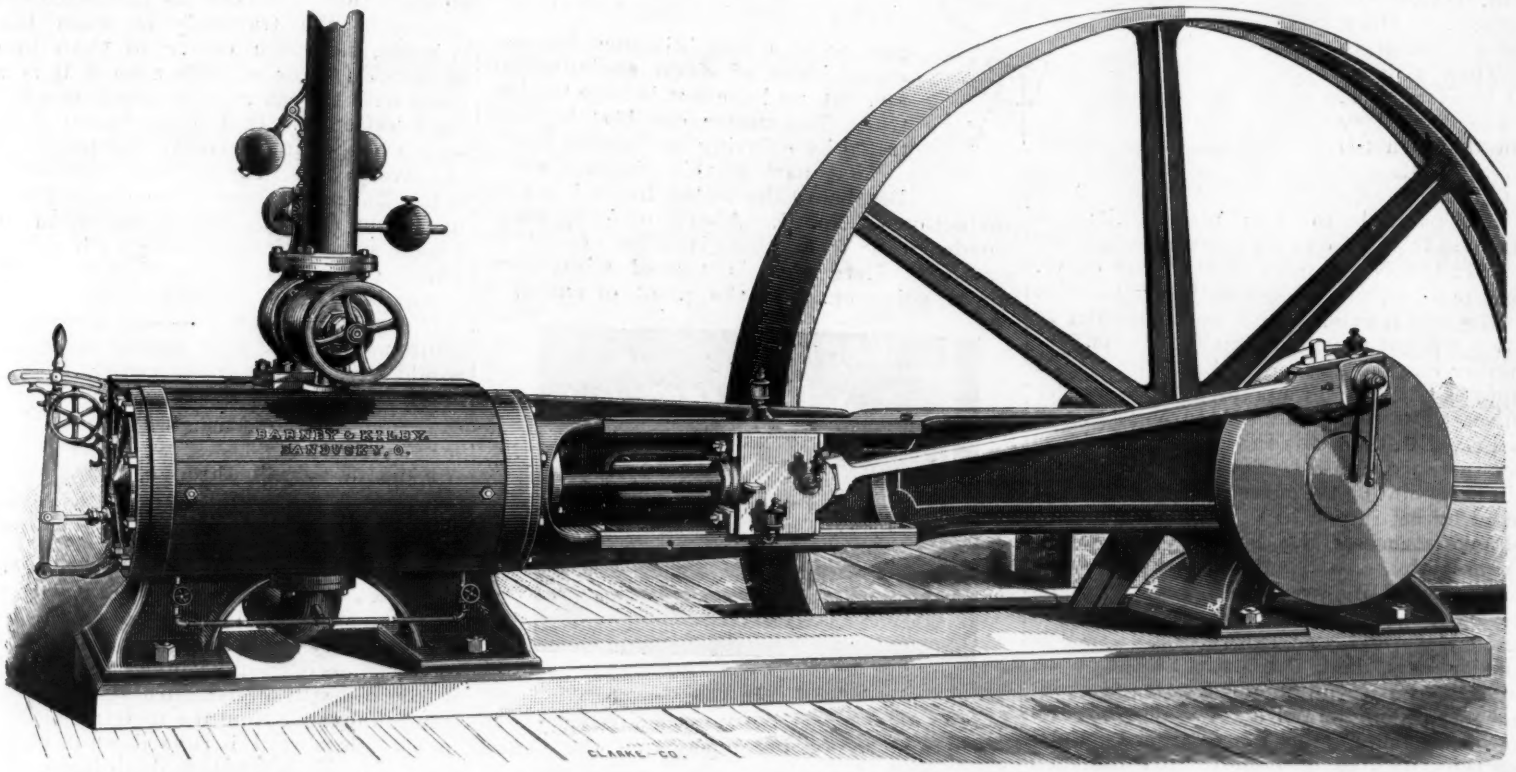
WEEKLY EDITION, Vol. XVII—No. 9. | CLEVELAND, O., MARCH 1, 1884. | MONTHLY EDITION Vol. II.—No. 3.

New Machinery.

The "Slide or Girder Bed" Engine.

The accompanying cut represents an engine called the "slide or girder bed," built by Barney & Kilby, Sandusky, O. The special features of this engine are its design and symmetrical form, its good proportions and excellent workmanship. The bed, main journal box and legs are one casting, also the cylinder and its legs, leaving but one joint in the whole engine between the cylinder and bed. All parts are made exceptionally strong, and the journals are amply large for the highest rate of speed for which these engines may be used. These engines are provided with a patent adjustable cut-off valve operated by a hand lever at the end of the



steam chest, the exact cut-off being indicated by figures, on index guide of lever. The piston and valve rods and crank and cross-head pins are steel. The connection boxes, cross-head and valve guide gibs are gun metal. These engines have proved themselves remarkably economical and give the very best satisfaction wherever used.

A Process for Softening Iron Castings.

Hardware Trade Journal, Birmingham, Eng.

A revolution in the manufactured iron trade is announced from Melbourne, where two local ironfounders (Messrs. Jenkins and Law) are reported to have discovered a new process in their trade. It appears that an accidental discovery was the commencement of the invention; a fragment of cast iron having been dropped while hot into a water channel, and afterwards broken, when it was observed to be soft and tenacious, instead of hard and brittle as might have been expected. This phenomenon led to inquiry and experiments, with a view to ascertain the reason of the change. It was supposed that the temperature of the metal and the composition of the water were the principal circumstances which combined to produce the transformation; and after numerous trials the right temperature to which the iron should be brought before immersion was discovered, and also what foreign elements were required in the water. The metal is merely dipped in the bath, not steeped, the required change being physical not chemical; and the ingredients of the liquid are common and cheap. As patented, the process is briefly as follows: The castings are run in a chill, or iron mould, allowed to cool. re-heated in a furnace to a particular temperature, and then plunged into the bath. Thus treated the iron develops a close, tough, and comparatively soft grain, so much like that of the average steel that, according to the Melbourne Argus, experienced founders in the colony had great difficulty in believing the metal to be cast iron at all. By this process it is claimed that the adamantine hardness of chilled castings is removed, and further positive advantages are conferred. Time is saved by the great extension of chill castings for purposes to which their hardness formerly rendered them inapplicable. It is contended that the metal is also made much stronger; a bar that would break with a load of 1,200 pounds under the old system being capable, if made in the new way, of withstanding a strain of 1,900 pounds. Lastly, the soft, tough grain produced by the new process increases the facility of working the metal, with a corresponding diminution in the wear and tear of tools, and a finer appearance in the finished article.

Rolling Mill Notes.

Weight of piles to produce boiler plates, allowing for waste in the furnace and waste in shearing: Add for every one-sixteenth of an inch in thickness one pound one ounce to every square foot of plate over and above the finished weight.

To make boiler plates from slabs, allow one-third more than the weight of finished plate, and for reheating and doubling five pounds to every 100 more than one-third must be allowed.

For plates narrower than twenty inches an allowance of ten pounds extra to every 100 pounds must be made for greater waste from shearing.

To make sheets from piles varying from 11 to 30 wire gauge, add one-half more than the finished weight, which is sufficient for waste and shearing upon both bar and sheet.

For merchant bars of all kinds which are rolled from the pile at one heat, one-fifth more than the finished weight is sufficient to allow for waste and cropping.

As regards wages the ironworker is paid per ton long weight. What is termed long weight is 2,400 pounds to the ton.

Coal Gas In Mechanical Trades.

A paper on this subject was read recently before the members of the Society of Arts of Great Britain by Mr. T. Fletcher, F. C. S. The lecturer began by stating that gas as a fuel was an absolute necessity for the economical carrying out of many commercial processes. There was one application of gas as a fuel which had not yet become generally known. That was the addition of a very small quantity of coal gas to the air supplied by a blower, or chimney pull, to furnaces burning coke or charcoal. The instant rise in temperature of the furnace and the greater stability of the solid fuel used were extraordinary. It appeared to the lecturer that there were very few manufacturing processes of any kind which could not be simplified by the use of gas as a fuel, from the production of electric light apparatus, to the manufactures of explosives, cotton stockings stained glass windows, brushes, &c.

A Link Motion Model.

Troy (N. Y.) Times.

Fred. W. Richardson of this city has presented to the Rensselaer Polytechnic Institute a beautiful model of the link and valve motion of the locomotive. The model, which is similar to those Mr. Richardson is manufacturing for the use of the master mechanics of some of the largest railroad corporations of the country, illustrates perfectly the link and valve motion of the locomotive under all possible practical conditions, and is valued at $450. The gift, which was entirely unsolicited and unexpected, is thoroughly appreciated by the institute authorities.

The Steel Works Company, of France, recently concluded a contract for 11,080 tons of steel rails at $33.88 per ton, delivered in Corisca. This contract, the terms of which are equivalent to about $29.04 at the works, has been given out by the French department railways company.

Drawing an Hyperbola.

American Journal of Railway Appliances.

A. M. writes to know of one or more methods of drawing a hyperbola. We shall preface this by the remark that the nature of the curve requires that the difference of its distances from its foci shall always be equal to a given line, and less than the distance between the foci.

From Prof. MacCord's recently published work on Kinematics,* we take the annexed diagrams: [See opposite page.]

In Fig. 1, from a central point, C, lay off in a line, two equal lines, C F, C F′; calling F and F′ the foci. Then set off C A and CB, less than CF and CF′, and use AB as the constant difference.

Take a radius, FO, greater than FB, and describe an arc, centred in F; and from F′ draw an arc with a radius, F′O=FO—AB. Where this cuts the first arc, gives us two points in the hyperbola; and proceed in the same way with other radii.

Referring to Fig. 2—another way is to use C as a centre, and AB, the major axis of hyperbola, to pass through some point, O. Draw a semi-circle on AB, and DCE perpendicular to AB, and a tangent, DT, to the semi-circle. Draw OS perpendicular to DE. Then with radius CL,=OS, on C, draw an arc cutting DT in L. On SO set off SG=DL, and join CG. Draw a line, KI, parallel to AB; produce it; et off DM=KI; then on KI produced set off KN=CM; and N will be a point in the curve. To get the focus, run CG out to the semi-circle; from R, where it cuts, draw a perpendicular to GR; this will cut the major axis in a focus.

Another way:—Referring to Fig. 3, where the asymptotes CR, CS and a point, P, in the curve are given. Draw any line, EF, through P, and make FG=EP; then G is in the curve; and so on; for instance, draw HGK; make KL=HG; then L is a point on the curve. The vertex will be found by setting off in the asymptotes, CR, CS, equal distances, CM, CN; drawing MN, and bisecting it by a perpendicular, CO, cutting the major axis. Where it cuts, as V, will be the vertex.

A fourth method is shown in Fig. 4. AB is the major axis, and P a point in the curve. Draw PO, BE perpendicular to AB, and equal to each other, and join PE. Divide PO and PE into the same number of equal parts, numbering the points of division from P on each line. From A draw lines to the points on PO, and from B to those on PE; join in the intersections.

* Jno. Wiley & Sons, N. Y.

Notes on Steam Engineering—The Setting of Valves.

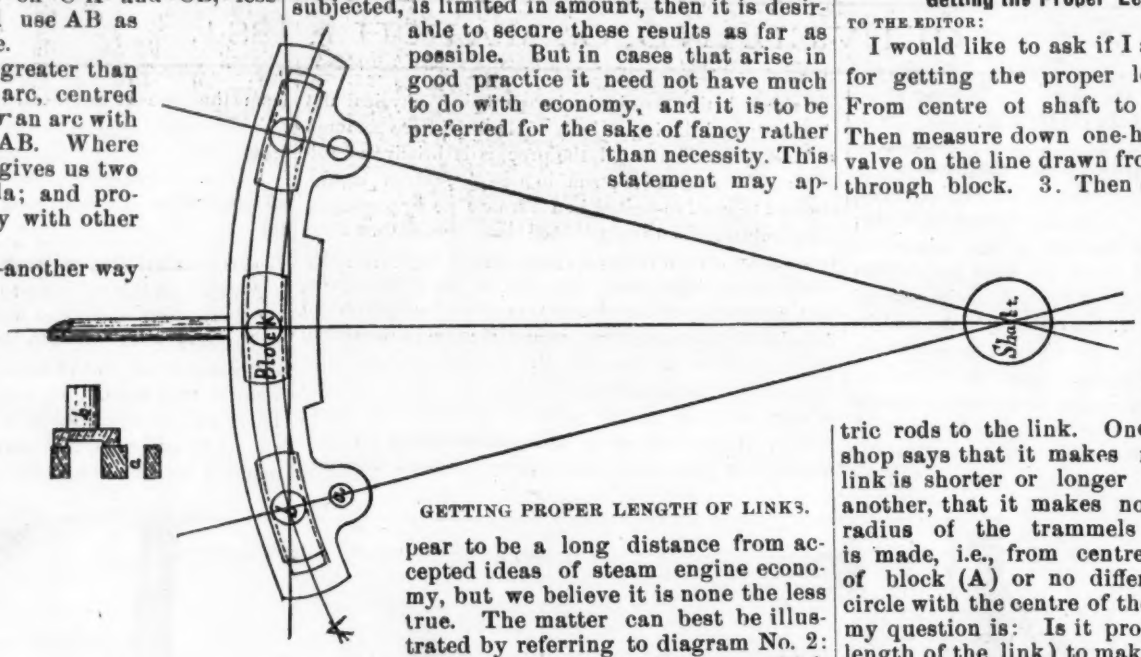
Boston Commercial Bulletin.

The manner in which the valves of a non-condensing engine shall be set so as to secure the best results is a question as to what shall be the shape of the indicator diagram. We will premise that the readers are somewhat familiar with the general characteristics of an indicator diagram so as to be able to comprehend the subject without introduction, and we shall treat the subject from this standpoint.

The setting of the valves controls the time when the steam is admitted to and shut off from the cylinder and discharged from the cylinder after doing its work. An ideal diagram for a non-condensing engine, is herewith shown.

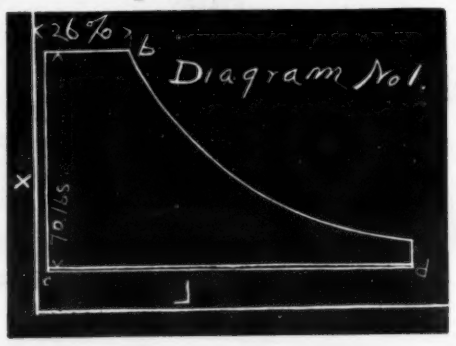
The shape of the diagram taken in practice is similar to this in essential features, but in points of detail it rarely corresponds exactly to this hypothetical form. We have seen diagrams from engines working at slow rotative speed that approached very closely to it, but under circumstances that commonly obtain, the corners are all more or less rounded. There are some people who consider that the nearer the shape of the diagram actually taken from an engine agrees with the illustration given, the more economical the engine will be.

Much is said, for instance, about the desirability of having the steam line—that is the line *a b*—parallel with the atmospheric line, and the point of cut off sharp. Although the attainment of these ends does not in every case depend upon the proper setting or action of the valves, it may be properly considered at this point. If either the boiler pressure, or the initial pressure to which the engine can safely be subjected, is limited in amount, then it is desirable to secure these results as far as possible. But in cases that arise in good practice it need not have much to do with economy, and it is to be preferred for the sake of fancy rather than necessity. This statement may appear to be a long distance from accepted ideas of steam engine economy, but we believe it is none the less true. The matter can best be illustrated by referring to diagram No. 2:

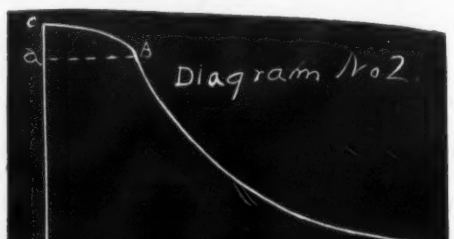


GETTING PROPER LENGTH OF LINKS.

That part of this diagram which lies below the dotted line *a b* is a reproduction of No. 1. Above *a b* it corresponds to a form that is often found in practice. Here what is termed wire drawing is going on, and the point of cut-off is



not sharply defined. In these respects it is not what is regarded as a well-formed indicator diagram, and many would say that the engine from which it was taken was wasting steam on account of these defects. The only difference between the two diagrams is that in the one there is 70 pounds initial pressure maintained up to a sharp cut-off, while in the other there is a higher pressure at the beginning, and this is gradually reduced so as to obtain at cut-off 70 pounds, or just the same as in the first case. The consumption of steam in the two cases is sensibly the same, but, as will be readily seen in the second case more power is being developed than in the first, the increased amount in



the illustration given being about seven per cent. To obtain this we have increased the pressure about 10 pounds. The increase in the amount of coal required for this increased pressure is less than one per cent. leaving a net gain of over six per cent. in power developed. It appears then that, in spite of the defects, the practical card is more economical than the ideal one. We do not wish to convey the idea that wire drawing and tardy cut-off valves are desirable, but we do wish to be understood as maintaining that an engine which gives diagrams defective in the respects named, may be running quite as economically as one which gives ideal diagrams.

Hints from Practical Men.

Getting the Proper Length of a Link.

TO THE EDITOR:

I would like to ask if I am right in this plan for getting the proper length of a link. 1. From centre of shaft to centre of block. 2. Then measure down one-half the travel of the valve on the line drawn from the centre of shaft through block. 3. Then draw a line at right angles across it at this point, until it crosses the centre line of the link. On a line from the centre of the shaft through this point the proper place to connect the eccentric rods to the link. One of the men in the shop says that it makes no differenee if the link is shorter or longer than the enclosed; another, that it makes no difference what the radius of the trammels is when the link is made, i.e., from centre of shaft to centre of block (A) or no difference if it is a true circle with the centre of the shaft or not. Now my question is: Is it proportioned right (the length of the link) to make the proper change of valve? This drawing is of the usual shape of the link; but suppose we connect it at (b) instead of (a), will not the oscilation be less? I make a cross section through a b showing the way to connect. TIRO.

AKRON, O., Feb. 20, 1884.

Our correspondent's method is correct for all ordinary practice. For special cases the form would have to be slightly varied.

Gas as a Heater.

TO THE EDITOR:

I desire to ask through your journal the chemists or gas producers to tell us something about gas as a heater. I have a 10x12 office with two sides of outside, northern exposure, one of which is glass, and I heat it with the gas from the street mains. I have a chimney for the escape of the burnt gases, but as I find no inconvenience from keeping this closed I close it to save heat. When burning the gas there is some annoyance from the moisture that collects on the glass until it runs down in puddles on the floor. This moisture doubtless comes from the hydrogen of the gas and the oxygen of the air, and the partial vacuum is filled by the atmosphere leaking in to the room.

Now I suppose the richer a gas is with hydrogen and the leaner it is with oxygen the better it is for heating purposes and the poorer it is for illumination. Our gas companies affect not to believe that electricity is the light of the future, but the news will get to them some day. What I want to ask the experts is: whether it is not practicable to eliminate most of the carbon from the gas and save it in the coke, and what would be the relative cost? And also what becomes of the nitrogen and carbonic acid gases arising from the consumption of the street gas and from my lungs in my little office? The subject is an interesting one and many would be greatly edified by its elucidation through your journal. J. H. S.

CLEVELAND, Feb., 22, 1884.

The Smallest Engine Yet.

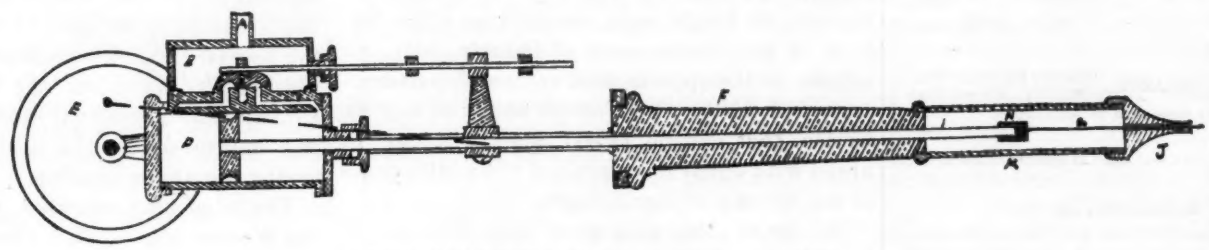
TO THE EDITOR:

Enclosed you will find the drawings of what I think is the smallest engine (which is run by steam) that was ever made to do practical work. The drawings are full size and the cylinder is ⅜ bore by ½ in. stroke. It was designed by myself and a Mr. S. Fox, of this city and was used

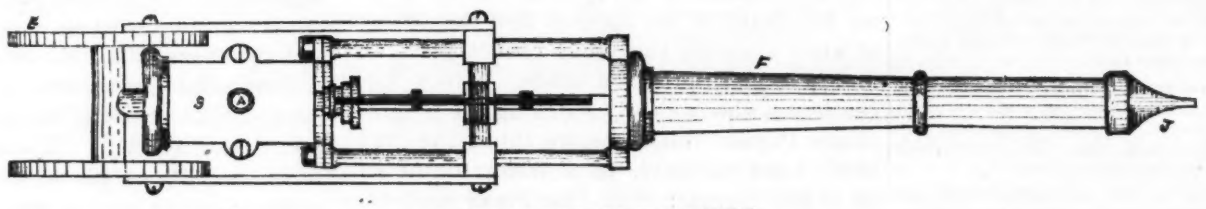
to perforate paper stamping patterns. It ran about 3,000 revolutions a minute, with 5 lbs. steam. It was used for some time and worked perfectly. You will notice that the valve mo tion is different from any other ever used on engines of this date; all you have to do is to refer to the drawings to understand its movement. It is made of brass, except the piston and valve rods. There is a needle fastened on the end of the piston rod to perforate the paper with.

It is made in a first class manner; the joints are made so perfect that you cannot tell where one piece joins the other. It was made by Fred Bright, maker of models and small machinery, in this city, and he deserves great credit for the manner in which the work is done.

This machine was not made for a toy or a model, but was made to do actual work, and it did it in a very excellent manner. It was so very small that we had some doubt about its working. We thought that the friction of the packing around the rods would be so great that it would not run at all, but the workmanship on it was so perfect and the stuffing boxes made so that the rods passed through them so nicely that we had no trouble with it—it ran perfectly. It was in use until we gave up the business of making patterns. I do not think any of your readers ever saw one any smaller than this to do work.



SECTIONAL VIEW OF PERFORATING MACHINE.



STEAM PERFORATING MACHINE.

EXPLANATION OF DIAGRAM.

A—Steam pipe. B—Steam chest. C B—Valve. D—Cylinder. E—Fly-wheel. F—Guide for piston rod. G—Needle. H—Chuck for holding needle to piston rod. I—Piston rod. J—Steel point and needle guide. K—Hollow casing around needle and chuck.

J. A. MORGAN.

CLEVELAND, Feb. 22, 1884.

—o—

The Electric Theory of Boiler Explosions.

TO THE EDITOR:

Having read in your journal, Mr. Getchell, "Isaac Newton" and "Boiler" upon the subject of boiler explosions, the itching to enter the list of disputants has simply—well, "Barkis is willin'." I think Mr. Getchell is entirely at sea, and his is a singular paper, to say the least, to pass the ordeal of the Civil Engineers' Club of Cleveland. It will not always do to discuss scientific questions as "teachers," unless we know something of primary causes and effects. There is too much life and property at stake, in discussing this question, to admit of assertions not warranted by well tested facts, and the scolding Mr. Getchell gets from "Newton" and "Boiler," is not unmerited.

That expansion, contraction and corrosion, will cause weak spots in a boiler, and that weak spots are subject to ruptures, is not even problematical. But that explosion always follows ruptures, is simple nonsense to any required number of practical engineers, and will not "hold water." Yet this is the whole of Mr. Getchell's paper in a nutshell. He evidently knows nothing of the causes of heat, or combustion, nothing of the components of water; nothing of gases and their atomic equivalents, and nothing of the chemical constituents of the iron composing the boiler, and yet he lays down rules as arbitrary as they are speculative and unscientific.

"Newton" tells us, that explosions are caused by "the instantaneous conversion of solids or liquids into gases or the instantaneous separation of the gases by fire," which is as "clear as mud," and scientifically, as exact as "goose and chicken: which will you have, sir?" One states that pumping cold water into a red hot boiler cools and strengthens it; the other theorizes in an opposite direction and shows it a dangerous thing to do. As for myself, I am of the opinion that there are times and cases, when the environments will admit of cold water injections; but as the environments are always inside of the boiler, I do not think it will pay to snap the cap, for the gun may be loaded, as many an engineer has found, at the cost of life and property.

That there is a mystery connected with boiler explosions no one will dispute. I believe that it can be explained, and a remedy found. A careful investigation will reveal the fact, that boilers explode, in defiance of low water, red hot flues, cold water injections, corrosions, weak spots and rupture. There are cases on record of the most fearful explosions of new boilers, with full gauges of water and a perfectly safe amount of steam pressure indicated. There are people, however, boiler inspectors, for instance, who are always ready to dispute any amount of evidence in this direction. I believe it true, and that no boiler explosion ever occured that was not the result of the conversion of the oxides of iron or other substances into free hot gas, and its mingling or combining with the gas equivalents of the water. This is theory—and let me say right here I do not set it up dogmatically, but simply for what it is worth as theory, unsupported, so far as I am aware, by a single practical or scientific test.

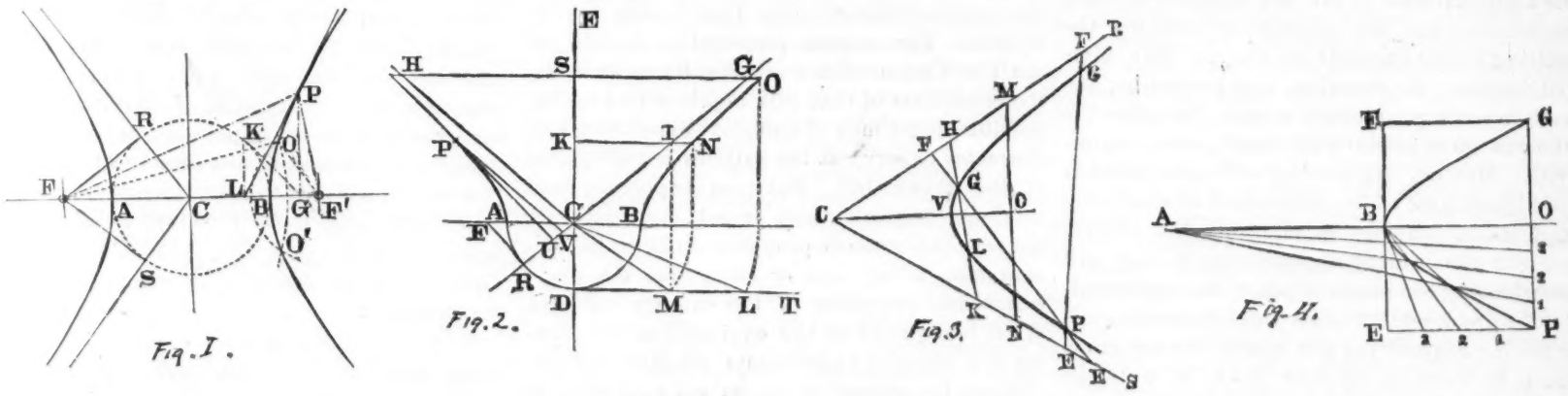
"Steam is water in its gaseous form, and should not be confounded with vapor, for the latter is the gases returned to water, or a state of water." It is composed of oxygen eight-ninths and hydrogen one. Oxygen, or in this case "carbonic acid," "has the power of supporting combustion;" that is to say, it constitutes the fuel consumed by heat. "Hydrogen is the most powerful of all the gases." It is heat, fire, electricity (?) in latent form. It is a lucifer match, containing an electric spark. "Combined with oxygen two volumes to one, it is the most powerful of explosives." "Combined with atmospheric air, two volumes to five of the latter, combustion suceeeds, emitting an electric flash (lightning), forming a watery vapor, and a vacuum, into which the surrounding air rushes, causing a collision of its particles which gives out a report—thunder."

If these quotations from Watt, and others, be true, explosion is the result of the formation and combination of these gases, in volumes necessary to produce combustion—heat—I think electricity. If I am not mistaken, friend Newton's water on an anvil, when struck by a hot iron, is converted into its equivalent gases by a species of electrolysis. That is to say, the heat emitted by the iron is equivalent to the heat emitted by the voltaic pile, because the results are the same — the gases are generated and exploded instantly. More than this: the iron being hot, loses its magnetism, it being taken up and utilized by the carbonic acid emitted by the iron, and, chemically, this proof rests in the fact that its affinity for hydrogen is dependent in a measure upon its magnetic power. Deductively, oxygen emitted from the hot iron unites in combination with the gases of the water ("in which combination a chemical action occurs between dissimilar bodies" expressed by volumes of heat,) decomposes water as rapidly, and with the same explosive effect, as that produced by the voltaic pile. At all events, the explosion that follows proves the adjustment of volumes of gases, necessary to produce combustion.

Correlatively, we have something upon which to base an intelligent thought as to the cause of and the terrific force generated by combining these gases in the shell of a boiler, in volumes requisite to produce combustion or an electric spark. The spark produced, the instantaneous decomposition of the water in the boiler must result and an explosion follows, with as sure destruction to the boiler and surroundings, as though the shell were loaded with powder, and ignited by electricity. Nor does it matter whether the boiler is old or new; whether there is 60 or 100 pounds of steam, if free, hot carbonic acid is generated and combined with the gases of the water, the boilers will be torn in shreds.

I think this theory has a foundation in chemical law, and that it will furnish the true

Concluded on Page 136.



DRAWING FOR HYPERBOLA—SEE PRECEDING PAGE.

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ENGINEERING AS A PROFESSION.

No one who was permitted to attend the recent meetings of the American Society of Mechanical Engineers and the American Institute of Mining Engineers, could but be struck with the high character of the men engaged in these professions, and the opportunity afforded the aspiring young engineer to rise to both fame and fortune. Engineering, as a profession, has risen to such prominence that it includes the whole range of public works and private enterprise. Military engineering no longer presents the highest goal to the attainment of which the student of technology is to direct his efforts; but with the growing unpopularity of war and the widening conquests of peace, the opportunities for great achievements in civil, mechanical or mining engineering are almost innumerable. Dr. J. M. Buckley, of New York, in a recent paper on the subject, well said that nowhere is the importance of this profession more manifest than in our own country, "which has vast rivers, the largest in the world, and immense coasts on the Pacific, the Atlantic, and the Gulf, a territory almost as large as the whole of Europe, with great cities at distances from each other greater than the distances which separate the capitals of the first powers of the Old World; vast plains requiring artificial irrigation, and more railways, telegraphs, bridges and lighthouses than any other three nations. Also, we are peculiarly a manufacturing people, employing the heaviest machinery, as well as the most conplex, and in the mining of coal, iron, lead, copper, gold and silver we are unsurpassed." The salaries attainable in engineering are large, often ranging from $5,000 to $8,000, $15,000,$17,000,and possibly higher, and added to this are the excellent opportunities for investment which the shrewd engineer above all others may improve. But in no profession has merit more to do with the compensation received. It is pre eminently a calling] in which hard study, quick perception and untiring energy are required. It is, in fine, a splendid profession for drones and numskulls to keep out of.

GOVERNMENTAL TESTS OF MATERIALS.

Recently we published the text of the Payson bill for a Test Commission and the substance of a bill introduced by Congressman Foran, of this district, for a Department of Industry, and from this has arisen in certain quarters the impression that in some way the bills were hostile to each other; in other words, that the passage of the Foran bill would either avoid the necessity of passing the Payson bill, or would render agreement upon it impossible. Despite the attack of the *Midland Industrial Gazette*, St. Louis, upon the motives of the author of the Department of Industry bill, we adhere to the opinion that such a department is needed in the Government and that any objection that can be raised against it can be urged with equal force against the continuance of the Bureau of Agriculture.

So far as the passage of the Foran bill (should it reach that point) affecting in any way the chances of the Test Commission bill, we are clearly of the opinion that the two are of such a nature that they cannot justly be said to conflict with each other. A New York gentleman who is closely watching the progress of the Payson bill, takes, we think, the right view, when he says, in a letter to the editor of this journal: "It [the Foran bill] does not meet the case in any way; or even supposing that the bill should pass the House and that all should be done which this bill contemplates, and that all the persons proposed in Section 3 of that bill should commence work at once, and give their entire time to the Test Commission, the organization would still be insufficient to do the work which the engineers of the country require to be done in this matter of tests. The experts proposed in the bill for the Test Commission would hardly serve under the conditions of that bill, and it would be impossible to get men of sufficient experience and character to serve at the salaries contemplated in the Foran bill. But even supposing that this was possible, there is not force enough, nor are the persons proposed in the bill of a character to lay out or carry out the plans which the engineers of the country propose. What is required by the engineers of the country is a series of experiments planned and carried out by experts of recognized authority, to ascertain exactly where the mistakes are being made now in regard to our structures; what experiments are necessary to settle what their mistakes are; to have new factors of safety, and to study the question of fatigue under different circumstances and under different forms of metal."

If it can be clearly shown that the Test Commission bill represents the wishes of the representative engineers of the country; that no adequate facilities now exist for carrying out and recording such tests, and that the bill is not gotten up in the interest of any special machine, there is no reason why it should not pass.

MUTUAL RELIEF AMONG WORKMEN.

The growth of mutual relief associations among iron-workers and others is a healthful indication. There is a comity of interest among men of the same trade that should be cultivated, not discouraged nor perverted. An association, therefore, that seeks to extend and strengthen these relations, and at the same time to afford aid at times when it is most needed, serves a doubly noble purpose. As showing what can be done in this line, we refer to two of such associations, not because they are alone in their good work, but because copies of their regulations have lately fallen into our hands. The employes of the Cleveland Malleable Iron Co. maintain a very successful mutual benefit society based upon the monthly assessment plan. Each member pays into the treasury, 25 cents per month in advance, and in return receives, in case of sickness or accident, $5.00 per week after the first week's incapacity, no member being allowed such benefits for more than twelve weeks at a time in any one year. At the death of a member each of the surviving members is assessed the sum of 50 cents and an equal amount of the sum total is at once drawn from the treasury, to be paid to the dependents of the deceased, and the treasury is reimbursed by assessment made on the following pay day. Intemperance, venereal diseases and failure to pay dues for one month operate as a bar to securing the above benefits.

The relief plan operated by the employes of the Westmoreland (Pa) Coal Co. is somewhat more extensive, but in the same line. The regular levy per member is 25 cents per month, but it may be varied so as to keep the balance on hand above $500. For two weeks' disability, or more, a member receives $5.00 per week, after the first week, benefits to cease after 26 weeks from date of accident. Disability must be from actual casualty at the mines, not injury from strain or otherwise that may be due to weak condition of the body. Beneficiaries are prohibited from doing any work unless specially permitted by whole committee. In case of loss of limb, the full amount of $125.00 may be payable at any time and at discretion $75.00 more may be paid toward getting an artificial limb. In case of death, $100.00 is paid to the widow or legal heirs, when a member dies from accident, and $50.00 when death is from other natural cause. To the above $100.00 the Westmoreland Coal Co. adds a like amount. The balance sheet of the fund shows that during the past year each member paid in twelve assessments of 25 cents each, or a total of $3.00, while 92 members received benefits ranging from $5.00 to $135.00, and there remained a balance on hand, over and above all expenses, of $857.80. This is a most excellent showing—can it be surpassed?

THE MECHANIC OF THE FUTURE.

There are several reasons upon which to base strong hope for the future of the American mechanic. The multiplication, with the consequent cheapening, of technical journals is one. Thousands of machinists, foundry-men and iron-workers generally, who a few years ago were contented to do little if any reading, are now subscribers to one or more publications devoted to their line of work. That the exchange of ideas thus brought about has greatly broadened the horizon of their work, goes without saying. The workman who reads must necessarily become a better workman for it. Again, the increasing disposition of practical men to write out their observations is a hopeful sign. The mechanic who trains himself to observe, note and submit to writing his experiences cannot help becoming more exact and intelligent in his work. Other important factors at work are the formation of mutual benefit societies among workmen, the establishment of reading rooms and libraries, the inauguration of lyceums, and the increasing value with which the artisan regards his right to vote—all pointing

unmistakably to his rapid elevation to wider influence and greater usefulness.

A CONSIDERABLE amount of spice entered into the Cleveland Civil Engineers' Club's discussion of the defects of modern engines, reported elsewhere in this issue. An attack all along the line appears to have been made upon many of the so-called improvements, and the assertion was more than once made that no substantial progress had been made for the past 40 years in engine-building. The subject is certainly a proper one for discussion, and we invite communications *pro* or *con*.

WE are pleased to make note of the fact that the employees of the Cleveland Rolling Mill Co. have formed a Reading Room Association and will soon be supplied with all the leading techinical papers of the country. We bespeak for the new enterprise the hearty support which it so much deserves.

THE number of letters patent issued in the United States in 1883 was 22,216, against 19,267 in 1882. New York leads the list, in the number of patents received, and other leading States follow in this order: Massachusetts, Pennsylvania, Illinois, Ohio, and Michigan.

WE have received notice of a mass meeting of inventors, to be held in Music Hall, Cincinnati, March 25, 1884. Its object is permanent organization for protection. Mr. J. S. Zerbe, 188 West Fifth street, Cincinnati, O., will give all desired particulars.

OUR "Hints from Practical Men" in this issue will be found to be fresh and interesting. Communications in this line are always welcome.

IT is the small economies that tell, in modern manufacturing processes.

DEFECTS OF MODERN ENGINES.

An interesting discussion was had at a special meeting of the Civil Engineers' Club of Cleveland, last Tuesday evening, on the paper read by Mr. E. H. Martin Chief Engineer of the Cleveland Rolling Mill Co., at the previous regular meeting, on "The Pumping Engine of the Period." We present herewith an outline of the many valuable points brought out:

In opening the discussion, President Holloway read from a newspaper slip the following statement of duty performed for twelve days ended October 10, 1883, of the Corliss engine at Pawtucket, R. I:

Number of hours run, 291 hours 33 minutes.	
Number of revolutions	245,464
Average reading of water gauge in feet	39.96976
Average reading of draft indicator, being distance from center of water gauge down to surface of water in pump well, in feet	7.25971
Average of total head against pump in feet	47.22947
Average temperature of water	65 deg.
Weight of a cubic foot in pounds	62.3931
Displacement of one revolution in cubic feet	84.954
Wood used to start fires in pounds	3300=1440 coal
Coal used to start fires in pounds	9600
Coal used while pumping, in pounds	43,795
Total pounds of fuel used	54,835

Duty, 111,906,926 foot-pounds per 100 pounds of coal consumed.

Mr. Martin, being called upon, said: We frequently hear that we have made great improvements in steam engines, particularly pumping engines, but I am at loss to determine in what these improvements consist when the indicator figures are our only data. If I were to give my opinion of the progress made in steam engines in the past 50 years, I would tell you candidly that we have made none at all. I don't know but we have improved the duty, but I am not even sure of that Sweaton showed that he could run to 2½ pounds; Watts ran to 3. It is true that we have in some instances run to 7 and 8, but we have also dropped to 2½. This was at exceptional expense, however, sufficient, I think to counter-balance it. So far as pumping engines are concerned, I don't believe we have advanced one bit Even as recently as 1880, we have the particulars of a test of an engine at Cincinnati—the Worden Compound Pumping Engine. This very identical engine was patented by Watts just 102 years ago, with this difference: the Watts engine worked for a number of years and was a very superior engine, but this was a very inferior one. The engineer says that he got 11¼ pounds of water to 1 pound of coal—enormous in itself, and more than I believe he got. But he had a most excellent boiler. After testng three times, they got 54,000,000 pounds. I question whether they can go over 9½ pounds of evaporation. At the rate claimed, if the engine were constructed properly, they should have gotten 154,000,000 pounds instead of 54,000,000. The figures are the greatest curiosity I ever beheld. In Pittsburgh and Allegheny they are not a foot in advance, and I could name a dozen others if comparisons were not invidious; but they are too bad to notice.

Mr. G. M. Reid—Isn't that evaporation higher than any other known?

Mr. Martin—Yes, sir.

Mr. A. C. Getchell—In your experience, did you ever see an evaporation of over 7 pounds of water to a pound of coal?

Mr. Martin—If it reached 6¾ with the ordinary class of coal, we would be doing very well. The carbon in coal is as one-third the regular Lehigh Valley anthracite. Briar Hill is supposed to go as high as 42 or 43; Salineville 31 or 32; Palmyra, not much difference. In any other coal we have never been able to get 6¾. A number of engines are reported as having evaporated 10¾ to 11¾; but when the condenser was put on, it was found that it passed water over, and that evidently the evaporation did not exceed 8¼.

Mr. Getchell—I find that in taking tests they don't take into account the wet steam; they take over water and dirt also.

Mr. J. Eisemann—What is the usual standard of tests of coal—anthracite or its equivalent, is it not?

Mr. Martin—Yes, sir. We take 90 as the average of carbon.

Mr. Holloway—I notice in the usual tests of boilers in one column is the amount of coal consumed, in another the carbon, and it is still further reduced to show the economy of combustible. In regard to the remark of Mr. Martin concerning the lack of progress in engines, it is a little surprising, and yet it is not so surprising after all. At the recent meeting of the American Society of Mechanical Engineers Mr. Emery estimated the life of a steam engine at about 30 years. I said at the time that Western engines hardly ever attained 30 years, and at this Mr. Emery arose and said that there had been no progress in the construction of engines in the last 30 years. He certainly is excellent authority.

A member—I find that in 500 horse-power, we could maintain it for $660 per horse-power per year.

Mr. E. H. Jones—I would like to ask if special conditions are not required for waterworks; also, what amount of evaporation is necessary to reach the duty claimed for the Corliss engine?

Mr. Martin—To the first question I answer, no, To the second I would say, 9 pounds. I believe if we can produce a useful effect from that evaporation we can easily accomplish 150,000,000 at an evaporation of 9 pounds.

President Holloway—The real facts are that the engine is a meter. It doesn't generate the power; the real economy is produced when power is generated with a small quantity of fuel. The engine saves in power only as it measures it out. A great many mistakes are made because we don't take into account the evaporation in the boiler, the amount carried away with the steam, etc.

A member—I believe Mr. Martin claims in his engine to get a high rate of speed in the steam piston; why is this not an improvement?

Mr. Martin—It does not follow that we did not get a quick-running pumping engine 40 years ago. I saw 200 feet of piston speed 25 years ago. What I claim is that every one must come to higher ratios of expansion and quicker piston speed. We can't get a maximum useful effect out of steam unless we get high piston speed. Because we can't get a high piston speed, our engines are failures. But I am sure our direct-acting pumping engines of late have shown a very high duty under extraordinary tests, though I doubt the truth of some of them. Last summer I took a trip to Saratoga especially to see the Gaskill engine there. This was reported to have performed a duty of 106,000,000, and the month previous to my visit 107,000,000, I believe, and yet when I visited it I found that it was making only 80 feet a minute piston speed. We have had the authority of Mr. Porter, Mr. Green and Mr. Buell that it made from 101,000,000 to 111,000,000. Yet I tell you that engine could no more have produced 110,000,000 foot-pounds than could one of these engines at your waterworks, and I question if the advantages are so good. I am sure the boiler was not, within a very great degree, as good as the Cleveland boiler. It is as necessary here, performing such a duty, to have 100 feet a minute as there; yet I believe a greater portion of the time it was not running more than 70. I believe there must have been at least 23 per cent. of steam wasted in condensation. They were running so slowly that it was a very narrow squeak to get the engine over the center. I wouldn't like to impugn Mr. Porter's character as an engineer; it stands high, and I have never heard it brought in question, but the least I can say is that he was misled, and for this reason: There was a branch under the main floor inside the engine. The main pipe was 12 inches, the by-pass, as nearly as I could measure it, was six inches in diameter. That by-pass was wide open, and the water was pouring right back into the suction. That, to my mind, plainly showed how the high duty was obtained.

Mr. J. Whitelaw—I visited Saratoga about the same time as Mr. Martin. I found the engine running as described, and as I went into the building—it was a hot day in August—I found the doors and windows all closed. I asked the engineer why this was so, and he replied that the engine hadn't been accepted yet, and that they were keeping all the heat in the building, so as to make as high a record as possible. I found that the engine in two of the days of that week had apparently made 112,000,000, and on another day 113,000,000. I brought home the figures and found by calculation that if they were right the duty was nearer 115,000,000. I also noticed the by-pass spoken of by Mr. Martin. I noticed also that, having head, the valves were not heavy enough to seat themselves, and the water in this way was forced back into the suction. At Omaha, from data obtained, I figured out that the engine, of identically the same pattern, was making only 67,000,000, while at Des Moines, also the same style of engine, the duty was a little less thon 31,000,000. I would like to ask, in conclusion, in regard to the duty of the Cornish engine—is not the piston travel very fast?

President Holloway—It is fast on the in-stroke.

Mr. Whitelaw—Is not the economy in that engine obtained by great degrees of expansion?

Mr. Martin—Yes sir. [Mr. Martin then read from his previous paper, and continued:] The merits and demerits of every engine can always be measured by the indicator, and by no other means. There are so many tricks in testing engines in other respects that it is impossible to get at the facts. All the rage is now for quick-running, high-speed engines, and with it a lot of clap-trap, including automatic cut-offs and the like. Of course there are some good ones, but generally they are glittering shams. I haven't seen an automatic cut-off produce results that can't be produced by evaporation. Even as early as 1786 an engine was constructed at Glasgow which achieved as much as the engine of to-day. It is on record for making 2½ pounds per horse-power per hour, by means of quickening speeds. By this system any of the direct-acting engines of to-day are thrown into the shade.

Mr. John Walker—The economy of steam was good in those days, but to say that we haven't gotten any better results in our times is rather broad. I am of the school of McNaught, of Manchester, England. I think his compound engine beats anything I know of. I believe if we take the cost of an automatic engine built to run quick and to run its life out in a short time, and take a compound engine, we shall have with the compound engine the greater economy in the long run. I believe in the compound engine; I think we are driving every day nearer to it. What we can economize in using the modern engines is more than counter-balanced by the ordinary compound engine, which uses the steam twice.

This closed the discussion.

Proper Pitch of Steam Pipes.

The Locomotive.

Steam pipes, whether used to convey steam for heating or power purposes, should always pitch downward from the boiler, so that the steam and water shall flow in the same direction. When pipes are arranged to drip back toward the boiler, there is always trouble unless the pipes are very short, or very large.

CHIEF Engineer Lorenz, of the Philadelphia and Reading road, has received from Germany sections of longitudinal and transverse steel ties which are being experimented with in this country. Their practical utility is to be tested on the line of the Philadelphia and Reading.

METALS AND THEIR PROPERTIES.

—o—

As to Fracture, Ductility, Tenacity, Lustre, etc.

BY ARCHIBALD M'KILLOP.*

[Concluded]

Another property, although not a very important one, which some metals possess, is their odor. Some metals, as iron, tin, etc., have a distinct and characteristic odor.

Mode of fracture is another property that should be attended to. Different metals have different kinds of fracture, as crystalline, fibrous, conchoid. In speculum iron, we have a crystalline fracture; the same mode of fracture is observed when iron is allowed to cool very slowly in a blast furnace. If a bar of wrought iron were broken across, we would have an example of fibrous fracture.

The fusing point of an alloy is always lower than the fusing points of the metals employed. This is well shown in an alloy called fusible metals, which may be prepared by heating two parts of lead, four of bismuth and one of tin; or more fusible still, eight of lead, fifteen of bismuth, four of tin and three of cadmium. This substance is fusible in boiling water. Another example of this property of alloys is seen in an alloy of potassium and sodium; neither of these elements is liquid at the ordinary temperature, but the alloy is.

An amalgam is a compound of mercury with some other metal. Some of these are soft and semi-solid, and others firm. The amalgams and alloys appear to be definite chemical compounds.

The utility of a metal depends upon: its toughness or tenacity, the plentifulness of the supply of its ores, and the facility of its extraction from ores. If a new metal were found, these would be the crucial tests put to it, and unless it possessed some advantage over the metals at present in use, it would not be manufactured. Any metal largely used must possess these properties. In the iron group of metals, iron is more generally applied than any of the other metals because of its cheapness and toughness.

Brittle metals have no tenacity; they are used as alloys in the arts. Type metal, an alloy of antimony, is a very important alloy of a brittle metal.

All of the metals, with the single exception of mercury, are solid bodies at the ordinary temperature They differ very widely in their fusibility. Thus some are fusible below the boiling point of water; others, as zinc, tin and lead, are fusible below redness; copper, silver and gold are fusible in furnaces, while cast iron requires a temperature of 1,500 deg., wrought iron 1,800 deg., and cobalt and nickel require the strongest heat of the furnace to fuse them. The platinum group requires the oxyhydrogen flame or the voltaic arc to fuse them.

Those metals which are volatile at a low temperature can be purified by distillation. Mercury is purified in this way.

Many of the metals show the property of malleability, i.e., the property of being permanently extended in every direction by heating or hammering. Some of them possess it to a remarkable degree. The metal gold can be beaten so thin that 250,000 sheets of it piled one above another are only one inch in thickness In this process there is a change in the molecular arrangement of the particles of the metals. Some metals may be rendered hard and brittle, and if the process of hammering were continued, the metal would crack. To prevent this the manufacturers have recourse to the annealing process—reheating the metal. By this process the particles of the metal again take their natural position, and the process of hammering can again be repeated. This process is very necessary in the manufacture of copper. The furnaces are generally heated with gas, which produces a more equable temperature and admits of a better result. The gas may be coal gas, or the carbonic oxide of Siemens furnaces. Some metals, again, are brittle, as antimony and arsenic—the slighest blow can break up antimony.

Ductility is another property of metals. It is closely allied to though different from malleability. It is more closely related to tenacity. Ductility is the power of being drawn out, the property of withstanding a tensile force. The following table shows the relative position of the more important metals on these points:

Name of Metal.	Tenacity.	Order of Malleability	Order of Ductility.
Lead,	1	Gold,	Gold.
Tin	1½	Silver,	Silver.
Zinc	2	Copper,	Platinum.
Palladium	11½	Tin,	Iron.
Gold	12	Platinum,	Copper.
Silver	12½	Lead,	Palladium.
Platinum	15	Zinc,	Aluminum.
Copper	18	Iron,	Zinc.
Iron	27½	.....	Tin.
Steel	42	.....	Lead.

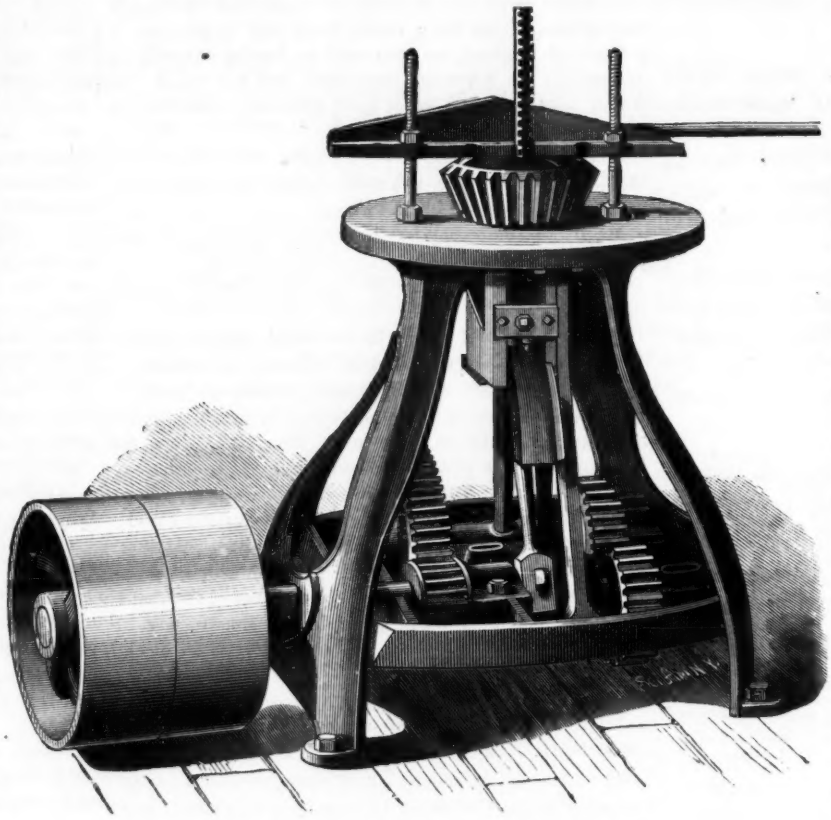
The tenacity of a metal varies with the purity. We would be led to anticipate this from the comparative tenacities of iron and steel. It also depends upon the molecular arrangement and temperature. This is a point of practical importance, for we sometimes find railroad accidents taking place in Winter, possibly caused by a change of molecular arrangement, caused by the lowering of the temperature. The tenacity of a metal is determined by putting a weight to the end of a wire of the metal and increasing the weight till the wire snaps. It is found that the tenacity decreases as the temperature increases.

Hardness of metals is another point worthy of consideration. Some metals are soft as wax, as sodium, potassium; others can be marked with the nail, as lead, while others, like steel and chromium, are hard enough to scratch glass and diamonds. The hardness of some metals is affected by alloying them with non-metallic bodies, as carbon, silicon, boron. Of late years artificial diamonds have been produced by the union of aluminum and boron.

The chemical character and relation of metals and non-metals show differences as great as their physical relations. The power of combining chemically is varied by their temperature and state of aggregation. Some metals in the form of powder have great power of combining chemically. It is found that bodies most opposite in their chemical relations have the greatest power of combining chemically, the more electro-positive element precipitating the less electro-positive one.

Some of the basilous elements are very firmly combined with the chlorous elements, so firmly, indeed, that for thousands of years they resisted the efforts of chemists to disunite them. Humphrey Davy had to employ the most powerful batteries in order to decompose them. It is found, however, that the basilous character of the elements is not absolute; in fact, there is nothing absolute in the properties of elementary bodies—it is all relative. The same element may be basilous when compared with one and chlorous when compared with another element. Compound substances possess basilous or chlorous characteristics, according to the preponderance of one or the other kind of matter present in its substance; therefore the character of the compound varies with the quantity of matter of one kind present. Berzelius thought that when he discovered this classification he would be able to explain all the laws of chemical action by means of it; but when it was found that electro-negative elements combined among themselves, his theory was at once upset. Although this classification cannot explain all changes, it is still of very great value.

*Mining Engineer of the Central Ohio Coal Co. Read before the Ohio Institute of Mining Engineers, January 9, 1884.



IMPROVED KEY-SEAT CUTTING MACHINE.

Improved Key-seat Cutting Machine.

The difficulty heretofore with key-seat cutting machines has been that they would leave the key-way higher in the middle than at either end, which necessitated the use of files to true it up. The machine illustrated avoids this and leaves the key-ways true and ready for the keys without further work. Key-ways of equal depth at both ends, for feathers, etc., are also readily cut. The rounding up of the bottom of the key-ways is avoided by rigidly connecting the cutter to a bar that extends down to the bottom of the machine, and there passes through a guide. This guide is pivoted so that the sliding bar may adjust itself to the angle of the slope desired for the bottom of the key-way. By this arrangement a movement of the cutter is secured which is practically parallel to its previous cut, and the defects in the key-ways above mentioned avoided.

The solid iron frame supports a circular iron table, truly turned, and having several holes for the reception of the vertical threaded studs which confine the yoke that holds the wheel or pinion to the table.

Large wheels do not require to be fastened to the table, so in that case the yoke is not used; and operators, after they become used to the machine, seldom find it necessary to fasten any sized wheels. When the machine is used without fastening the work to the table the operator places the end of a flat steel bar in the eye of the hub in which it is desired to cut a key way, and by pulling back on the upper end of the bar the lower end is brought against the smooth back of the cutter during its downward cut, which causes it to cut more or less heavily, at the will of the operator. During the return stroke upward this pressure is released and again applied on the next or downward stoke. A steel cutter projects through a hole in the table, and through the bore of the wheel, and is connected at its lower end with a slide moving in ways below the table, and connected by a strong connecting rod with a crank which is driven by a train of gearing from the driving shaft, the latter taking its motion from any suitable source of power through a belt. The gearing increases the leverage of the power over the cutter, so that the motion is very strong and positive, and the work is quickly done.

By means of elliptic gears a slow movement is given to the cutter downward while cutting the metal, and a quick return movement upward. The cutter is fed up to its work by the lever run at the back of the yoke, and the cut may be made light or heavy, according to the character of the work. For further particulars address the manufacturers, Trevor & Co., Lockport, N. Y.

Manufactures.

CLEVELAND.

THE C. & L. W. Ry Co. have recently purchased 1,000 new coal cars.

MR. RICHARD GORDON, of this city has lately invented a smokeless furnace which has received the endorsement of leading experts.

THE rumor that capitalists from this city were looking in Cleveland for a location for car works can be traced to no authentic source.—[Youngstown News-Register.

MR. S. T. Everett's new $1,000,000 bank, to be located on the corner of Superior and Seneca streets, has ordered its vaults and safes of the Diebolt Safe and Lock Co., Canton.

CLEVELAND parties have been negotiating for the purchase of the Harmony mills (building), Cuyahoga Falls, for manufacturing purposes, but, we learn from The Reporter the project has fallen through.

THE first steel rails by the new process were rolled at the Cleveland Rolling Mill Co.'s works last Monday evening. The work was quite satisfactory, barring the usual stiffness to be expected in new machinery. The rail mill was to run single turn the first week in order to allow the men to become accustomed to the new order of things. From 40 to 50 hands are dispensed with by reason of the new arrangement.

MR. W. J. HAYES, Gen'l Manager of the wire mills, informs us that the inquiry for goods in his department is, if anything, a little more healthy than it has been, but prices are very low and no change for the better is apparent.—The Cleveland Rolling Mill Co. have just received an order from Receiver Craig of the Toledo, Cincinnati & St. Louis narrow gauge for 1,000 tons of steel rails, fifty-sixpounds, and all the necessary spikes, bolts, &c., for laying the same.—A new enterprise has recently been started in the Eighteenth ward under the name of the Hayes Manufacturing Co. Mr. W. L. Hayes and Mr. John Lynman are equally interested. They have now several machines working on braided telephone wire, and will soon commence manufacturing several kinds of useful wire goods.—[South Cleveland Advocate.

OHIO.

THE Webster, Camp & Lane Machine Co., Akron, have been running quite steadily all Winter, in spite of the complaints of dullness in the machinery trade generally.

THE Jefferson Iron Works, Steubenville, made an experiment of covering their wet nails with wet sawdust while in the bluer. They came out cleaner than before, making a saving of $5,000.

THE Columbus & Hocking Coal & Iron Co., Columbus, we learn, are negotiating for machinery for drawing their coal cars into and out of their drift mines by cable, thus dispensing with mule power.

CAPITALISTS in this city are negotiating for a tract of 1,200 acres of coal land lying in the vicinity of Wampum, Pa.—It is rumored that James Westerman of Sharon, is making arrangements to erect a blast furnace at the Hall shaft.—[Youngstown News-Register.

THE Lorain shops of the Cleveland, Lorain & Wheeling Railroad are to be supplied with a new steam hammer. The times says that there never was a time since the shops started that so much work has been done as the past Fall and Winter with the same amount of help.

THE Lechner Manufacturing Co., Columbus, manufacturers of roller detachable chain belting, elevating and conveying machinery, have recently received a large number of orders for their driving belts, elevators, conveyors, &c., and report the outlook as encouraging. This company has lately issued its new illustrated circular, which will be sent on application.

A NILES letter says: During the past week many have been the rumors concerning the old mill. Parties have visited the town for the purpose of negotiating for the purchase of the same, but at the present writing nothing has been accomplished, although we anticipate a move that will again place our town in a prominent position among the manufacturing towns of Ohio.

IN GENERAL.

THE Greenville (Pa.) Progress says that William L. Scott, of Erie, is negotiating for the rolling mill of P. L. Kimberly & Co., at that place, with a view to making it pay, merely for a change.

IT is said the Bethlehem Iron Co. has 1,500 men employed in its iron ore mines in Cuba.

THE Beaver Falls (Pa.) steel works are on full time and have more orders than they can fill.

SOME soft steel made by the Pittsburgh Steel Casting Co. recently analyzed, showed but one-third of one per cent. of impurities, divided among silicon, manganese, phosphorus and carbon.—[Pittsburgh Telegraph.

THE citizens of Lewisburgh, Pa., have raised several thousand dollars, which, with a building site and other gratuities, will be given to a party of men who are going to build a rolling mill and nail works. By the end of the first year the works will probably employ 150 hands.

THE fine new nail factory ot the Sharon Iron Co., began operations on Monday morning last. The greater part of the 60 machines in it are running this week and by next week the whole of them will be. When in full operation the factory will have a production of about 350 kegs a day. Every department of the Sharon Iron Co. is now in full operation, the puddling department running double turn.—[Sharon (Pa.) Herald.

AMERICAN MINING ENGINEERS.

The Cincinnati Meeting a Success—Interesting Papers Read.

SPECIAL CORRESPONDENCE.]

CINCINNATI, Feb. 12.—The twelfth annual meeting of the American Institute of Mining Engineers was brought to a successful close to-day. Convening at 10 A. M., the Society was first addressed by Mr. J. D. Weeks, on "When was Coke Pig Iron made in Colebrookdale, England?" The first experiments, he said, were made by Prof. Darby, in England in the year 1735, while Scribner places the date at 1713. An interesting discussion followed Mr. Weeks' remarks, by Professors Raymond and Egleston. In 1835, the first coke pig iron was made in the United States at Cincinnati, O.

Next followed a paper, "Torsion," by Dr. A. A. Springer, Cincinnati, O.

The Secretary's report followed. For the last fiscal year the receipts of the Institute were $17,598.25; expenses, $13,886.29; surplus, $3,711.96; balance on hand last year, $5,028.52; balance, $8,740.48; invested in United States bonds 4½ % $4,400.00; balance in treasury, $4,340.48. Total members to date 1,341.

Dr. T. M. Drown, for ten years the Institute's valued Secretary, was elected an honorary member.

Following this came a lecture on "Effusion and Plating of Iridium," by Prof. Wm. L. Dudley. The lecture was very interesting. Several different specimens were shown the members.

"Analyses and Tests of Steel," by Pedro G. Salom, Chemist and Superintendent of steel department of Chester Rolling Mills, Thurlow, Pa. This paper was fully discussed by several members.

A paper on "Iron Ores of Alabama and Tennessee," was next read by Prof. J. B. Porter, Cincinnati.

The time and place of holding the next meeting was by vote left with the Council.

Officers for the ensuing year were elected, as follows: President (one year)—J. C. Bayles, New York city, Editor Iron Age; Vice Presidents (two years)—Ecley B. Coxe, Drifton, Pa.; Dr. Thomas Egleston, New York city, Edmund C. Pechin, Cleveland, O. Managers (three years)—Edgar S. Cook, Pottstown, Pa.; Frank Firmstone, Easton, Pa.; G. W. Maynard, New York city. Treasurer T. D.Rand, Philadelphia, Pa. Secretary, Dr. R. W. Raymond, New York city.

After remarks by the retiring President, the meeting adjourned for one year.

The banquet on Wednesday evening was one of the most pleasing features of the meeting. Following is a list of members present.

Arthur V. Abbot, New York city; Truman H. Aldrich, Cincinnati, O.; W. S. Ayres Allamuchy, N. J.; J. C. Bayles, New York city; Wm. F. Biddle, Philadelphia, Pa.; G. Billing, Denver, Col.; S. M. Buck, Coalburgh, W. Va.; M. C. Bullock, Chicago, Ill.; M. D. Burke, Cincinnati, O.; C. Constable, Constableville, N. Y.; F. P. Davis, Washington, D. C.; Dr. Thomas Egleston, New York city; S. F. Emmons, Denver, Col.; J. W. Farquhar, Easton, Pa.; Robert Forsyth, Chicago, Ill.; F. W. Gordon, Pittsburgh, Pa.; E. C. Hegeler, La Salle, Ill.; J. F. Holloway, Cleveland, O.; Robert W. Hunt, President, Troy, N. Y.; W. R. Jones, Pittsburgh, Pa.; Wm. Kent, New York city; Charles Kirchhoff, Jr., Hoboken, N. J.; J. S. Lane, Akron, O.; Wm. Lilly, Mauch Chunk, Pa.; Prof. N. W. Lord, Columbus, O.; H. Eckert, Reading, Pa.; E. V. McCandless, Pittsburgh, Pa.; P. H. Moore, Olympia, Ky.; Wm. Moore, Denver, Col.; Wm. B. Page, Leadville, Col.; J. P. Pardee Stanhope, N. J.; E. C. Pechin, Cleveland, O.; Prof. W. N. Perry, Cincinnati, O.; A. Plummer, Cincinnati, O.; R. A. Pomeroy, Georgetown, Col.; Prof. W. B. Potter, St. Louis, Mo.; R. W. Raymond, Secretary, New York city; P. G. Salom, Philadelphia, Pa.; S. Stutz, Pittsburgh, Pa.; J. E. Sweet, Syracuse, N. Y.; J. C. Temple, Dayton, O.; Prof. C. O. Thompson, Worcester, Mass.; L. E. Warner, Cincinnati, O.; J. D. Weeks, Pittsburgh, Pa.; S. T. Wellman, Cleveland, O.; S. Whinery, Meriden, Miss.; David Williams, New York city; J. P. Witherow, Pittsburgh, Pa.; H. A. Hunicke,———; C. B. Going, Cincinnati, O.; J. B. Porter, Cincinnati, O.; H. S. Smith,———; P. H Brown, Middleburgh, Va.; Floyd Davis, ———, Va.; W. F. Aldrich, Montevallo, Ala.; C. M. Atkins, Penn.; Frank A. Hill, Penn.

STEEL UNDER GREAT STRESS.

Physical and Chemical Tests of Boiler and Ship Plates.

BY PEDRO G. SALOM.*

The object in making these tests was to fill the specifications for the steel for the United States Government cruisers, four of which are now in course of construction at Chester, Pa., at the yard of Mr. John Roach. The specifications for the steel were the most difficult under which steel had ever been made, and it was considered very doubtful, at the time they were made, whether they could be filled. The great difficulty in making this steel was to get the high tensile strength and a high per centage of elongation at the same time, either one of which of course could readily be obtained. After a number of trials and failures we succeeded in meeting the specifications with gratifying regularity. The tensile strength required was not less than 60,000 pounds, and not less than 23 per cent. elongation in 8 inches for ship plate and from 57,000 to 63,000 tensile strength and not less than 25 per cent. elongation in 8 inches, for boiler plate.

In addition to these tests, two of which had to be made from every heat, it was required that a test piece from every plate after having been heated red hot and plunged into cold water, should bend double without showing signs of fracture. The inspection was very rigid and severe, the inspector requiring the specifications to be carried out to the letter.

As an example of the absurdity to which this was at first carried, a heat that gave a tensile strength of 56,900 was rejected. Some very interesting points in regard to the nature of steel were developed by these tests. The results of these tests, some 200 were tabulated and presented to the members of the Institute.

Mr. Salom also in his remarks stated that from the results of these tests he was convinced of the importance and necessity of having a standard test piece, as from the present modes of testing it was impossible to get a true knowledge and clear idea of the character of the metal being tested.

A committee was appointed to look into the matter of making some standard test pieces and report at their next regular meeting. The paper was discussed at some length by several members, and now is to be made a special paper for discussion at the next meeting.

*Read by Pedro G. Salom Chemist and Superintendent of Chester Rolling Mills at Thurlow, Pa., before the American Institute of Mining Engineers at Cincinnati February 21, 1884, and specially summarized for this journal by the author.

Market Review.

OFFICE OF IRON TRADE REVIEW.
CLEVELAND, FRIDAY EVENING, Feb 29, 1884.

IRON ORE.

Considerable ore, aggregating over 100,000 tons has been sold the past week at prices in advance of those realized in January and the early part of February. The demand continues fairly active. The major portion of Bessemer ores that can be produced have been contracted for, and several of the standard hematites have been sold up to the full estimated production of the mines for 1884. As near as we are able to ascertain, there have been from 1,400,000 to 1,500,000 tons of ore sold for delivery at Lake Michigan and Erie ports during the season of 1884. A fair proportion of this is hard Bessemer ore. There is very little low grade ore being sold. As regards lake freights, charters have been made for a limited number of trips from Marquette at $1.15 and vesselmen are offering six trips from Escanaba with coal up, at $1.10, with few takers. They want a considerable advance on above figures for season contracts, which as yet they have not been able to realize, as no season charters have been made. Shipments the past week have been 8,787 tons against 11,230 last week. We quote:

No. 1 Specular and magnetic Bessemer Ores per ton	$5.75@ 6.50
No. 1 Specular (non-Bessemer) ores per ton	5.50@ 6.00
Bessemer Hematites	4.75@ 5.00
Non-Bessemer Hematites	4.50@ 4.75
Menominee Range Bessemer	6.00
Menominee Range non-Bessemer	4.50@ 4.75

A gentleman just returned from the Upper Peninsula reports that with the exception of five of the larger mines, the operators have cut down the output. Some have cut down the size of shifts; others have cut off night shift; while some are doing only dead work, and still others have shut down altogether.

PIG IRON.

A good demand exists for both mill and foundry irons, better than has been known for a year or more. Inquiries are numerous, but actual sales are only in lots of from 100 to 500 tons. Dealers claim that quotations are down to hard pan, and can go no lower, but buyers show a growing disposition to "shop" around and buy, (other circumstances being equal) where they can get the most concessions. Receipts of pig iron the past week were 715 tons, shipments, 203 tons; against receipts 1,404 tons and shipments of 182 tons last week. We quote f. o. b. cars at Cleveland, 4 months:

CHARCOAL PIG IRON.

No. 1 Lake Superior charcoal	$22.50@24.00
No. 2 Lake Superior charcoal	22.50@24.00
Nos. 3 and 4 Lake Superior	22.50@25.00
Nos. 5 and 6 Lake Superior	22 50@24.00
Nos. 1, 2, 3, 4, 5, Salisbury	34.50@36.00
Southern Car Wheel	27.50@32.00

BITUMINOUS AND COKE IRON.

No. 1 foundry, all lake ores	$20.00@21.00
No. 2 same	19.00@20.00
No. 1 foundry, lake ores, with cinder mixture	19.00@20.00
No. 2 same	18.00@19.50
No. 1 foundry, native Ohio ores	20.00@21.00
No. 2 same	18.00@19.50
No. 1 silvery, native Ohio ores	20.00@21.00
No. 2 same	17.00@19.00
No. 1 gray forge, red short	17.50@18.50
No 1 gray forge, neutral	16.50@17.50
No. 1 Bessemer	20.00@21.00

Pickands, Mather & Co., of this city, have secured the agency for Maryland Ohio Scotch, (standard softeners).

Pickands, Mather & Co.'s March circular, just out, says: "The past month has shown considerable improvement in demand, with a disposition on the part of a number of buyers to contract for supply several months in advance, but a feeling generally among manufacturers not to sell very largely for future delivery at prevailing prices."

E. L. Harper & Co., Cincinnati, announce by circular received that they have arranged for the manufacture of an American Scotch pig iron at Baltimore, Md., so that they can advantageously supply a desirable softener to seaboard and Eastern consumers. Imported Scotch, because of the superior quality of the domestic article, has been superseded and almost entirely discontinued by the Western trade. This Iron is to be known as the "Queen," American Scotch.

IRON AND STEEL.

A slight improvement is noticeable, and a better feeling seems to exist. The increased demand for bar iron is especially marked.

WROUGHT PIPE.

A better feeling is noticeable, and a corresponding increase in demand. There was an informal meeting of the Empire Iron Co., Limited, last week but nothing was accomplished beyond an agreement to hold on till trade picked up. Prices and discounts are still well maintained. The agencies have been restricted to between 20 and 25 of the largest cities in the country, including those having local works.

SCRAP IRON.

An increased demand for scrap iron is to be noted, but at such low prices that holders are disposed to wait for an anticipated advance, although there seem to be no prospects of any better prices in the immediate future. Sales of old rails are reported aggregating 2,000 tons; $23.00 was the price received, including transportation to point of delivery in the Youngstown district, which would make the price in Cleveland about $22.00.

HARDWARE.

Trade continues to increase but orders are still small; country merchants seem to be short of money, and this fact makes collections poor.

NAILS—A brisk demand has sprung up for nails, probably in anticipation of an advance in prices, and there is but little doubt if the Spring opens up with a fair amount of building a decided advance will be made. Stocks are light and somewhat broken. At the special meeting of the Western Nail Association held in Pittsburgh this week, no business was transacted except the presentation and discussion of reports. No accumulation in stocks was reported; the new card was being well maintained, demand was brisk and inquiries more numerous than usual at this time of the year. The mills stopped by the floods were reported starting up.

GLASS—A New York dispatch, dated Feb. 18, says: "The National Window Glass Manufacturers' Association and National Bottle and Vial Manufacturers' Association have resolved to advance the prices of glassware generally ten per cent. The Western manufacturers agreed to continue receiving orders from customers and send them East, where the goods will be manufactured and then turned over to the Western men for delivery. Goods will be manufactured for the Western men at the same cost as in their own factories. The Western factories would remain closed until the men agreed to resume work."

MACHINERY OILS.

Trade is a little more active in some sections. Prices on animal and marine oils are firm, with an upward tendency. The mineral oil market is fair, with no change in prices.

COAL.

Prices remain unchanged. The continued cold weather exerts a stimulus on sales. There are no present indications of improvement in prices in the near future. The recent strikes will probably have no influence in that direction. A meeting of Ohio coal representatives was held in Buffalo recently. The supposed object was to form a combination to compete with the Buffalo combination for the Grand Trunk contracts, although the exact object has not yet been made known.

CINCINNATI PIG IRON MARKET.

[Reported for IRON TRADE REVIEW by E. L. Harper & Co.]

The market continues fairly active. The Ohio Valley so recently inundated has begun to revive already, and will quickly recover from the results of the recent flood. The mills and foundries are rapidly resuming operations, and are requiring crude iron quite liberally. The curtailment of production of manufactured iron has strengthened the market. We quote as prices current:

FOUNDRY.—Hanging Rock Charcoal, No 1, $22 50@$23 50; Hanging Rock Charcoal, No. 2, $21 25@$22 25: Strong Neutral Coke, No. 1, $18 50@$19 00; Strong Neutral Coke, No. 2, $17 50@$18 00; American Scotch, No. 1, $19 00@$19 50. GREY FORGE.—Neutral Coke, $16 75@$17 25. Cold Short, $16 25@$16 75; CAR WHEEL AND MALLEABLE—Hanging Rock, Strictly Cold Blast, $27 75; Hanging Rock Warm Blast, $24 00@$24 50; Lake Superior, Charcoal all grades $24 00@25 00; Southern CarWheel Strictly Cold Blast, $26 50@$27 50.

[Reported for IRON TRADE REVIEW by Rogers, Brown & Co.]

The market has been without special feature for the past week. There is no demand yet from Ohio River points, but trade continues fair in the North and West and prices are without change of any kind. The lately submerged foundries and mills have come out of the flood with less damage than was expected, and will shortly be under full headway again. Many will run double time to catch up with delayed orders. The stove foundries have not been running since December, a stand-off between manufacturers and molders on the question of a reduction in wages, being in progress. It is thought an understanding will soon be reached. General business is looking brighter. Several round lots of charcoal foundry and car wheel iron were closed about the end of the week. We quote for cash:

Hot Blast Foundry.—Hanging Rock Charcoal, No. 1, $22 00@$23 00; Hanging Rock Charcoal, No. 2, $20 00@22 00; Southern Charcoal, No. 1, $21 00@$22 00; Strong Coke, No. 1, $19 00@19 50; Strong Coke, No. 2, $17 50@$18 50; Strong Coke No. 3, $17 00@$18 00; Soft Stone Coal, No. 1, $19 00@$20 00; Soft Stone Coal, No.2, $17 50@$18 50. Forge—Strong Neutral No. 1, mill 16 50@$17 00; Cold Short No 1 mill, $15 50@$16 00 Car Wheel Malleable—Hanging Rock Cold Blast $30 00@$31 00; Hanging Rock Warm Blast $23 00@$26 00; Southern Car Wheel Iron $25 50@$26 50; Lake Superior Car Wheel Iron, $24 50@$25 50; Lake Superior Malleable Iron, $24 50@$25 50.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

The market continues without change in tone or price. Before the flood prices were advanced on Hot Blast Irons about 50 cents per ton and considerable sales were made at the advance. But the stoppage of business occasioned by the flood has lessened the demand. The market, however, continues firm. We quote for cash as below:

FOUNDRY IRON.—Hanging Rock Charcoal, No. 1, $22.00@$24.00; Southern Charcoal, No. 1, $21.00@$22 00; Hanging Rock Stone-coal and Coke, No. 1, $20 00@$21.00; Southern Stone-coal and Coke, No. 1, $19.00@$19.50; Southern Stone-coal and Coke, No. 2, $18.00@$18.50; "American Scotch," $17.50@$18.00; Open Silver Gray, $17.50@$18.00; Close Silver Gray, $16.50@$17.00 MILL-IRONS.—No. 1, Charcoal, $19.00@$20.00; No.1, Stone coal and Coke, Neutral, $17.00@$17.25; No.2, Stone-coal and Coke, Neutral, $16.25@$16.50; No. 1, Stone-coal and Coke, Cold Short, $16.50@$16.75; No. 2, Stone-coal and Coke, Cold Short, $15.75 @$16.25; White and Mottled, Cold Short and Neutral, $14.50@$15.00. CAR-WHEEL IRONS.—Hanging Rock, Cold Blast,, $28.00@$30.00; Hanging Rock, Warm Blast, $22.50@$23.50; Alabama and Georgia, Warm and Cold Blast, $23.00@$26.50; Central Kentucky, Cold Blast, $25.00@$26.00.

OILS.

Pure Oils. p'kages included		Linseed oil, raw	57@60
Sperm, winter bleached per gal	1 25@1 30	do do boiled	60@63
Whale, winter bleached per gal	75@80	Cotton seed oil white	50@55
Straits	54@57	do do yellow	49@54
Bank	51@54	West Virginia lubricating 28 deg	12c@15c
Lard oil extra W S	78@85	Paraffine oil winter pressed	18@28
do No 1 do	65@70	Capitol Cylinder	75
do No 2 do	60@65	Model do	60
Tallow oil	70@75	Eldorado Engine	45
Neatsfoot oil pure	95@$1 00	Turpentine, per gal	43
do No 1	80@85		

COAL,

WHOLESALE.

Wholesale f.o.b. cars at Cleveland:

Carbon Hill and Monday Creek	$2 50	New Hazelton, mix	1 20
Massillon	2 50@2 85	" " nut	2 00
Palmyra, lump	3 25	Connotton	2 25
Brier Hill	3 10@3 35	Connotton, mix	1 20
Pittsburgh	3 00	" nut	2 00
Saline ville	2 25	Anthracite grate	5 40
Tuscarawas	2 30	Anthracite egg	5 58
New Hazelton	2 50	Anthracite stove	5 86
		Anthracite chestnut	5 98

RETAIL.—Delivered.

Massillon Lump	$3 5'@4 00	Palmyra, lump	4 25
" Nut	$3 00@3 50	New Hazelton	3 50
Carbon Hill and Monday Creek, lump	3 50	Connotton	3 00
Carbon Hill and Monday Creek, nut	3 25	75c less on cars by car load.	
Straitsville, lump	3 25	Anthracite Stove and Chestnut	6 75
Straitsville, nut	2 75	Egg and grate	6 50

The Electric Theory of Boiler Explosions.

Concluded from Page 131.

key to "the mystery of boiler explosions," as soon as Government and insurance companies cease to investigate coroners' juries and the colloquial *debris* of boiler explosions, and institute scientific and practical experiments. A careful reading of the report of Mr. Gray, Secretary of the Board of Trade of Great Britain, leads me to conclude that not only the officers who reported to him, but the Secretary himself, were as destitute of real data, in naming the causes of 45 cases of boiler explosions as any of their cousins on this side of the water. All evidence gathered by investigating committees, and inspectors, who do not comprehend the first principles of the ozonification of oxygen, nor the combustible nature of hydrogen, must of necessity partake of gossip that adds nothing to real knowledge of causes. In the meantime property is destroyed and lives are lost, while ignorance apes the wisdom of science, and indulges in "Yankee guesses," by way of soothing the poor man's widow, who lost his life shoveling coal into the fire bed of a boiler.

Time and space bid me close this paper abruptly How is red hot oxygen generated and combined in a steam boiler? will furnish the basis of another draft upon these columns at some future time. GALVINI.

BISMARCK, Mich., Feb., 22, 1884.

THE Chicago Manual Training School for Boys was formally opened on the 3d inst. Some 65 applicants were admitted, and the school starts forth under most favorable auspices. The elegant buildings, corner of Michigan avenue and Sixteenth street occupied by the institution, are not wholly completed, but sufficient room is afforded for the accommodation of the pupils at present. The faculty for the year will consist of the principal, Mr. Henry H. Belfield; Mr. Benjamin Hyde, a graduate of the Illinois State University at Champaign, and Albert L Tucker, of the Worcester Free Institute.—[Indiana World.

The new four-cylinder engine, which has been on trial on the Boston & Albany Railroad for a week past, is said to be making a poor showing, because the grades are so heavy that the compounding arrangement won't work. When run as an ordinary double-cylinder engine, it eats up more fuel than the heaviest engines on the road, and draws no more cars.—[The Tech.

Cleveland Wholesale Prices.

[The lowest quotable prices are given in all cases.]

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.. " " 19 50

Axes.

per doz.
James' 2d qual..... $7 00
Buckeye..... 7 75
" doub. bitt..... 15 00
Hunt's..... 9 50
Mami's..... 8 00
Lippincott's Crown..... 8 50
Cut More..... 9 00
Peck's Double Bit..... 22 00
"Champion Blade..... 11 00
Good triple silver steel.. 11 50

Axles.

Standard list,....
Nos. 1 to 6, 50 & 10 off
Nos. 7 to 14, 50 & 5 off
Nos. 15 to 18, 45 off
Nos. 19 to 22, 50 & 5 off

Anvils.

per lb.
Eagle, Amer.....10c dis 20
Wright's.....10¼c@11c
Armitage's Mouse Hole.....9¼c@9¾c
Trenton.....10½c
Wilkinson's.....10¾c

Anvil Vise and Drill.

Millers Falls Co. $18.....dis 20
Cheney Anvil and Vise dis25&2

Augurs and Bits.

C S cut augers.....dis 60
do do do bits.....60
D C gimlet do Ives.. dis 50
Snells bits.....dis 60
Russell Jennings' augers, new list dis 25
Cook's pat augur.....40&10

Animal Pokes.

Akron.....$ 3 50
Camp's.....4 00
Berea, per doz.....4 00
Eagle, per doz.....5 00

Apple Parers.

Domestic & Reading ℔ doz. $7 00
Turn Table.....4 50

Axle Grease.

Frazier's, per gross,.....$10 00
Common, " 6 00

Bolts.

Carriage com, old list...80&20
Tire, common, old list...80&20
Eagle carriage bolts.....70
Philadel. " " 75
Stove bolts.....50
Plow bolts.....40
Machine.....75
Cast iron barrel bolts . 55&10
Wr't " " " 55&10
Cast iron chain bolts.. 65&10
Wr't iron sq'r bolts.... 55&10
Wr't shutter bolts..... 55&10
Ives' pat. door bolts... 50
Sargent's list
Bolt Ends 16c. per lb. net .. 75
Cast Iron Barrel Shutter, etc.....dis 55&10
Wrought Barrel.....dis 55&10
Wrought Square.....dis 55&10
Wr'g't Shut'r, all iron, Stanley's list.....dis 50&10

Bright Wire Goods.

List June 5th, 1883.....70&10

Bellows. Dis

Hill,s.....40 pr cent
Bl'ksmith's com new list,50 ℔ ct
Moulder's new list, dis 25 ℔ ct
Hand, new list, 25 per cent

Butts. Dis

Wrought brass.....75
Cast, loose joint.... 60&10
Pin, loose..... 60&10
Wrought, fast joint narrow.....60
Wrought fast joint broad.....60
Wrought loose joint broad.....60
Wrought table and back flaps.....60
Loose joint, without acorns.....60
2 per ct. extra dis for cash.

Boiler Plates.

"Gaylord"-Standard Quality.
C. No. 1.....4 00
C. H. No. 1 Shell.....4 25
C. H. No. 1, 50,000.....5 00
C. H. No. 1, 55,000.....5 50
C. H. No. 1 Flange.....6 00
Firebox.....
T. S., 60,000 .....(as per)..6 00
T. S., 65,000 .....(act of)..
Homo. Steel, 70,000 (of Cong) 7 00
Heads, ¼c ℔ lb. extra.
N.B.-Eastern brands of boiler plate at from 2-10 to 3-10c ℔ lb less than above prices.

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch.....dis 25
"National" Special Locomotive Tubes.....net list

BoilerMakers' Tools.

Doty's Power Shears..net list
" Hand Lever Shears.net list
" Power Punch.....net list
" Hand Punch.....net list
Steel Screw Punch.....net list
Iron Screw Punch.....net list
Boiler Plate Rolls.....net list
Buffalo Forges & Blowers dis 20
Watson's " " net list
Spring Tube Expander..dis 15
Roller Tube Expander.net list
National Tube Cleaner..dis 20
Wire Flue Brushes.....net list
Anvils-"Peter Wright" 12½ ℔ lb
Solid Box Vises.....net list

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Cleveland Stamped Elbows

Genuine Russia Iron

4½ inch, per doz..... 5 50
5 do do 7 50
6 do do 9 50
7 do do 11 00

Charcoal Iron

4½ inch, per doz..... 2 50
5 do do 3 50
6 do do 4 50
7 do do 5 50

Planished Amer. Russia Iron

4½ inch per doz..... 5 00
5 do do 6 50
6 do do 8 50
7 do do 9 50

Discount 33⅓ per cent

Chisels.

Hot and cold cutting...℔ lb 30
Railroad track..... 30
Machinists..... 30
Mallet head..... 50
Tape..... 50
Packing..... 50
Stone cutters..... 50

Crowbars.

Cast steel..... ℔ lb 5
Iron, steel points..... 4½

Cutlery, Pocket and Table.

Meriden Cutlery Co., table net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co. list net
Aaron Berkenshaw's pocket dis 25
Fram Cutlery Co., . table net
Cleveland Cutlery Co...dis 25
Miller Bros., pocket.... 33⅓
Akron Cutlery Co.....dss 45

Coopers' Tools.

Bradley's..... dis15@20
Braton's..... dis15@20

Chains.

Coil by cask,.....

3-16	¼	5-16	⅜	7-16	½
9	7½	6 15	560	5 10	495

Drills and Drill Stocks.

Blacksmiths', each $2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W ...dis 20&10

Drawing Knives.

Peck, Stow & Wilcox....dis 70
Witherby's.....dis 65@10
Nobles Mfgr. Co.....15
Adjustable handle.....20

Emery and Sand Paper.

Regular Numbers.....℔ lb 6c
Flour and F. F.....℔ lb 4c
B. & A. Emery Paper...dis 35
Sand paper.....dis 35

Enameled & Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 30
Tinned Sauce Pans.....dis 30

Files.

Parkin's $5 to £..dis 45 ℔ cent
E.M. Boynton's, new list dis 25
J. & Riley Carr .....4.50 to £.
Johnson & Bro. .....dis 50
Butcher's.....4.50 to £.
Walter Spencer & Co.'s "Diamond".....4.50 to £.
Western..... 40
H. Disston & Sons (new list)..... dis 40 per cent
Heller Bros.' Horse Rasps dis 35
Nicholson..... dis 40
New American..... dis 40
Union File Co..... dis 40
Dayton File Works.... 40

Grindstones.

Berea.....1@1½ ℔ lb
Ohio.....1¼@1⅜ ℔ lb
Nova Scotia.....1¼@1½ ℔ lb
Lake Huron.....1@1½ ℔ lb

Hammers.

Maydole's.....dis 15
Cheney's.....new list 20&40
Hartford Hammer Co....dis 20
Humason & Beckley.....dis 15
Verree.....dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75, dis35&10
Nelson Tool Works..dis 40&10
Warner & Noble's.....dis 5
Kip's.....dis 30

Hatchets.

Buckeye.....Shingling,
Nos...1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 40
Claw,
Nos...1, 2, 3,
℔ doz $8 25, $8 75, $9 25, dis 40
Lathing,
Nos...1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 40

Hay Knives.

Lightning.....per doz. net $18
Wadsworth.....33⅓

Hinges.

Champion double acting spring hinges.....dis. 30
Screw & Strap 6@12 in..... 4c
" " 14 in. & larger 3c
Gravity Locking Blind Hinges, Sargeant & Co. 70&10
Clark & Co.....70&10
Strap and T Hinges.....60&10

Locks.

Whipple Mfg Co..... 60
Norwalk Lo Co..... 60

Nails.

10 to 60d.....$3 50
8 and 9d..... 25
6 and 7d..... 50
4 and 5d..... 75
3d..... 1 50
2d..... 2 75
3d fine..... 3 00
2d fine..... 3 75
¾ inch..... 3 00
4d barrel..... 1 00
1¼ inch barrel nails..... 1 50
1¼ do do do 1 75
1 do do do 2 50
¾ do do do 3 00
Cut spikes, all sizes..... 35
Clinch nails, all sizes..... 1 75
Casing and box nails..... 75
Finishing nails,.....$1 25
Tobacco nails,..... 50

Nuts and Washers

Nuts, square..... 5c off list.
Nuts, hexagon.....9c. off list.
Washers.....7c off list.

Nuts, Bolts, etc.

Machine Bolts.....dis 75
Bolt Ends.....dis 75
Boiler Patch Bolts.....net list

Picks.

Railroad, 4 to 5 lbs.. doz $6 60
5 to 6 lbs.. 7 20
to 7 lbs.. 7 80
7 to 8 lbs.. 8 40
Railroad Tamping Pick.. 7 to 8 lbs..doz 10 80
Mill Picks per lb..... 75c

Planes.

Ohio Tool Co.....dis 20
Sciota.....dis 25
Bailey's Pat. Adjstbledis 20@10
Sandusky, fancy.....dis 15
Buckeye.....dis 20
Ogontz.....dis 25

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe new list and dis.....
Gas Pipe-
New List ⅛ to 1¼ black 30 dis galv'd 20 dis
1½ and larger black.... 50 dis galv'd 35 dis
Malleable Iron Fittings... 25
Grey Iron Fittings....dis 50
Steam Brass Goods.....dis 55
Water " " .....dis 50
Ludlow Gate Valves...dis. 20
Register Gauge Cocks net 1 00
Montg'ry Gauge Cocks $1 each
Steam Gauges.....dis. 40
Steam Guages 5 in. net dial per doz.....30 00
Scotch Glass Tubes.....dis. 70
Tools.....special.
Duplex Injectors.....net.
Soil Pipe & Fittings, Mott's List.....dis. 30
Sinks, Mott's List.....dis. 25
Copper Bath tubs, sinks, etc.....dis. 25
Galvanized Iron Boilers "Knifes."....dis. 50
Marble Slabs, Counter-sunk net per ft.....$ 1 25

Tinners' Tools & Machines.

Machines (P. S. & W.) ... less 10
Tools (P. S. & W.) ..... " 20

Rivets.

Iron.....dis 45
Tinned.....dis 45
Copper.....dis 40 & 10

Rules.

Stanley.....dis. 70 & 10

Shovels and Spades.

Ames' new list, July 1, 1881,.....dis 17½
Old Colony.....dis 17½
Remington's (Lowman's Patent).....dis 30
Bishop.....dis 50
Chisholm.....dis 33⅓
Rowland's.....dis 50
Griffiths.....dis 50

Screws. Dis

Flat head iron or steel [new list] per cent dis. 75
Flat head brass..... 70
Round head iron or steel 65
Round head brass..... 60
Brass and Silver capped. 40
Japanned, list of Plain Screws.....40&10
Coach, patent Gimlet point, list per 100..... 70
Lag, taper points..... 70
Bed..... 10
Machine, flat head, iron. round head, iron 50
Bench, iron.....55&10
wood, beech, per doz $3..... 10
wood, hickory.....20&10

Saws.

Disston.....dis 20
Disston's Circular.....dis 40
Disston's hand panel, rip, &c.....dis 20
Boynton's lightning cross cut new list.....dis 40
Boynton's circular and mill.....dis 40
Boynton's ice.....dis 25
Boynton's lightning hand panel and rip.....dis 25
Livingston's butcher and kitchen.....dis 20
Livingston's framed wood Nos. 101 102 103 104 105 doz $10 8.50 10 7.50 6.20 net
Peace circular & mill...dis 40
Peace hand panel and rip.....dis 25
Peace band saws, all widths.....dis 10

Scales.

Hatch, Counter, No. 171... ℔ doz. $42, dis 45
Union Platform.....$6, dis 45
Fairbanks'.....dis 25
Buffalo Scale Co.....dis 40
Forsyth Scale Co.....dis 30
Howe's.....dis 20&10
Chatillon's Eureka.....dis 25
Family Union Scale.....dis 50
Scale Beams.....dis 40&10

Sheet and Tank Rivets.

"Norway."

All sizes.....dis. 15

Boiler Rivets-"Albany." ⅛, ¼, 11-16, and ⅜ in. diam. 4 00
"Standard" ⅛, ¼, 11 16 and ⅜ inch diameter. 4 00

Sad Irons.

From 4 to 10 lbs.. per lb 3 net
Self-Heating.....℔ doz $9 net
" Tailors..℔ doz $18 net
Gleason's Shield and Toilet.....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
Mrs. Pott's Irons, square back.....dis 35
Enterprise Star Irons....dis 35
Combined Fluter and Sad Iron.....℔ doz $15, dis 15

Squares. D.s

Steel or iron, case lots.....55
Try squares and T bevels....40

Spikes-WROUGHT

All lengths by ¼ inch 3½c
do do do 5-16 3
do do do ⅜, 7-16 & ½ in 2¾

Tacks, Brads, &c.

New List Sept. 1, 1883.
Tinned Swedes tacks....dis 30
" American " ... 30
Swedes tacks, all kinds ... 30
American cut tacks..... 30
Copper tacks and nails.... 30
Swedes Hungarian nails.. 35
Gimp and lace tacks..... 30
" " " tin'd. 30
Furnishing nails..... 25
Trunk and clout nails..... 25
Common and pat. brads... 20
Basket nails..... 20
Brush tacks..... 20
Leathered carpet tacks ... 20
Cigar box nails..... 20
Chair nails..... 20
Double pointed tacks..... 40
Extra 10 per cent. on all the above.

Valves. Dis.

Jenkins' Patent Gate Valves.35
" " Globe ..40
" Standard Packing " ..20

Vises.

Solid box.....45&50
Solid "Crown" (A. H. Hildick)....40 to 100 lb, 15c net
Solid, Peter Wright's.....15½
Solid, Wilkinson's.....14&15
Parallel, Parker's.....dis 25
" Simpson.....dis 20
" Prentiss.....dis 15
Saw Filers, Hopkins' ℔ doz $17.50, dis 10
" Wentworth's.... 9 00
Cowell Hand Vises.....dis 20
Richardson's Vise and Anvil.....dis 25

Wrenches.

Coe's genuine..... 50
Girard Standard....dis 50 & 10
Mechanics' 10 and 10....dis. 50
P. S. & W. Mechanics dis 50&10
Agricultural.....dis 70
Campfield & Sutliff
Engineer's..... 50
Mechanics'..... 60
Agricultural..... 70

Wringers.

2½ inches Universal.....$ 6 00
2 inches Eureka..... 36 00

Wire. New List.

Brass and Copper.....dis 15
Bright & annealed, Nos. 0 @ 18 dis 70
" " Nos. 19 @ 26 dis 70
" Nos. 27 @ 36 dis 75
Coppered Nos. 0@18, dis 65
Galvanized, Nos. @18, market list,..... dis 60
Tinned, Nos. 0 @ 18, dis 50@52½
Cast steel.....dis 55
Tinned Broom Wire, Nos. 18 @ 20.....8c lb.
22 to 22.....8½c lb net
Annealed Fence, Nos. 8 and 9..... dis 70
Annealed Grape, Nos. 10 to 14..... dis 70
Galvanized Telegraph, Nos. 7 to 9.....6½c lb net
Galvanized Telegraph, Nos 10 to 11.....℔ lb 7¼c
Galvanized Telegraph, No. 12.....℔ lb 7½c
Fence staples...℔ lb 5½@5¾c
Fence Staples, galvanized, ℔ lb 6½@6¾c
Stubs Steel Wire regular 75 per lb net
Barb Wire, painted..... 5c
Barb Wire, galvanized.. 6c
Roebling's Iron and Steel Wire Rope (Roebling List).....dis 15

TINNER'S STOCK.

Tin.

Banca,.....per lb. 22⅜
Straits..... " 20½c
English..... " 21½c
Bar..... " 23c
Spelter..... 5¾@6c

Tin Plate,

IC 12x12 charcoal.....$ 6 25
IC 14x20 do..... 6 25
IX 14x20 do..... 5 00
DC 12½x17 do..... 7 00
DX 12½x17 do..... 9 00
DXX, 12½x17 do..... 11 00
DXXX, 12½x17 do..... 13 00
IC, 20x28 do..... 13 00
IX, 20x28 do..... 17 00
IC, 14x20, Best Roof..... 5 75
IX, 14x20, do..... 7 50
IC, 20x28 do..... 11 75
IX, 20x28 do..... 15 25
IC, 10x15 Best Coke..... 5 65
Subject to card discount.

Solder.

Half and Half, in bars....14½
No. 1 do....13½
Spelter Solder.....25

Fat Planished Sheet Iron
[A].....per lb 10½c
[B]..... " 9c

Nos	10 to 14	15 to 20	21 to 24 & 26	25
Com	3-10	3-30	3-40	3-75
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra.

Zinc.

Sheet, cask..... 6½c
Sheet, open..... 6¾c

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass

All Nos not thinner than No. 28, wider than 2 in. not wider than 14 inch.....30c
All Nos to No. 28 inclusive, and widths over 14 to 20 in. inclusive.....35c
All Nos to No 28, inclusive, and widths over 20 to 30 in. inclusive.....38
¼c per lb advance on each No above Nos 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at.....53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c pr lb. more than High Brass
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars.....48c
Sawed.....51c
Planed or Polished...54c

For Slitting.

Metal in width in. to ⅛ in. to No. 28, inclusive, 1c per lb., advance.
Metal, in width 2 in. to 1 in. thinner than No 28, 2c per lb. advance
Metal, in width ⅛ in to ¼ in thinner than No 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths add 7c per pound.
Sheathing Brazier Copper, Bolts, etc.
All sizes, 16 oz. per sq foot and over. per lb.....22c
nd over per lb.....22c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 22c
Brazier's Copper, 10 oz and 12 oz per sq. ft...per lb. 23c
Brazier's Copper lighter than 10 oz. per sq ft...per lb. 32c
Circles less than 84 inches in diameter.....per lb. 38c
Circles 84 inches in diameter and over.....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz per sq. ft.... per lb. 22c
Bolt Copper.....per lb. 28c
Copper Bottoms per lb. 22c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x48.....per sheet 6c
All other size sheets, 2½c per square foot. For tinning both sides, double the above amount.

LEAD.

Amerc'n, ℔ lb.....4¼@4¾c
Bar, ℔ lb.....5½c
Pipe, ℔ lb 5¼c dis 10 per ct
Sheet, ℔ lb 5¾c dis 10 per ct
Tin-lined pipe 15c dis 10 per ct
Block.....45c.
Chilled Shot.....8c

Babbitt Metal.

Genuine, per lb., net..... 25c
Crescent, " 22c
Extra, " 20c
No. 1 " 15c
No. 2 " 12c
No. 3 " 9c
No. 4 " 5½c

COPPER.

Lake Ingot.....15@15½c
Baltimore.....14½@15c
Arizona.....14½@15c

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch..... 1 70
4½ to 6 by ⅜ to 1 inch..... 1 95
1¾ to 6 by 1½ to 1¾ inch 2 25
1¼ & 1¾ by ⅜ to ¼..... 1 95
1 & 1¼ by ⅜ to ¾..... 2 05
⅝ ¾ and ⅞ by ⅜ to ½.... 2 25

Round

1 to 1¾ inch..... 1 80
2 to 2¾..... 2 10
2¾ to 3¼..... 2 40
3¾ to 4..... 2 90
4¼ to 4¼..... 3 40
4¾ to 5..... 3 60

Square.

1 to 1¾ inch..... 1 80
2 to 2¾..... 2 10
2¾ to 3¼..... 2 40
3¾ to 4..... 2 90
4¾ to ⅞..... 3 00

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch 2 10
1 to 1¾ by ¼ and 5-16 do 2 20
⅝ to ⅞ by ¼ and 5-16 do 2 40
⅝ to ⅞ by ½ and 5-16 do 2 80

Half Oval and Half Round.

Wagon box iron ¼ and ⅜ 3 50
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¼ to 6 by ¼ to 3-16..... 2 70

Hoops.

1¼ to 2 , Nos 16 to 18..... 3 10
1¼ to 4 do 13 to 15..... 3 00
1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24..... 3 00
No 25 to 26..... 3 25
No 27..... 3 40
No 28..... 3 80

English Steel.

Best cast.....℔ lb 16c
Extra cast..... 16½c
Round machinery.. 10c
Swaged, cast..... 18c
Best double shear.... 15½c
Blister, 1st quality.. 13c
Refined tool steel.... 16½c
Spring calking..... 7¼@7½c
German steel, best.. 11c
2d quality..... 10c
3d quality..... 9c
Sheet cast steel, 1st quality..... 15½c
2d quality..... 14½c
3d quality..... 13½c

American Steel.

Best brands of refined cast steel, ⅜ to 2 inches..12c
Crucible cast.....7c
Open-hearth ditto.... 4½c
Hammer cast steel.... 9c
Spring cast steel..... 5½c
Bessemer and open-hearth spring..... 4½c
Ditto plow..... 3½c
Steel boiler plate.... 6½@7c
Bessemer machinery.5 @6c
Spring and calking...7¼@7c
Tire..... 4
Sleigh shoe..... 4

Bessemer Steel Tire.

⅝ to 1 by 3-33..... 3½ ℔ lb
⅝ to 1 by ½ to 5-32.... 3¾ ℔ lb
⅝ to 1 by 3-16 to ⅜.... 3¾ ℔ lb

Miscellaneous Cast Steel.

Auger and auger bit..... 10
Axle steel for wagons..... 7
Frog points and plates..... 8
Frog size bars..... 8
Pick, hammered..... 10½
Mattock, beveled..... 9
Table cutlery..... 7½
Trap spring steel..... 10
Pike and cant hook..... 8½
Coal and granite..... 9

SCRAP IRON AND OLD METAL.

DEALER'S BUYING PRICES

	Per Ton
No. 1 R R wro't scrap....	$19
No. 1 wrought scrap.....	17
No. 1 Machine cast scrap.	14
Stove plate (free from burnt iron).....	11 00
Grate bars.....	8 50
Pipes and flues (clean)....	15
Tank iron.....	14
Hoop and band iron.....	10
Light sheet iron.....	9
Axle turnings.....15 00@16 00	
Wro't turning (f from cast)	13
Wro't iron, oily drillings 9@10	
Cast borings..... 9 00	
Malleable iron.....	9
Uncut wro't iron boilers	15
Old copper per lb.....	...10½
No. 1 H. Brass per ℔.....	11
Heavy yellow Brass do..	9@10
Light Brass per ℔.....	7@9
Scrap Zinc per ℔.....	2@3
Tea Lead per ℔.....	3
Heavy Lead per ℔	4
Rails.....	22

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe

	Inside Diameter. Inches.	Weight Per Foot.	Price Per Foot Black.	Price Per Foot Galvan'd
Butt-Welded.	⅛	.24	08	
	¼	.42	08	$0 05
	⅜	.56	08½	0 05½
	½	.84	04¾	0 06
	¾	1.12	06	0 07½
	1	1.67	08	0 10½
	1¼	2.24	11	0 14
Lap-Welded.	1½	2 68	21	0 24
	2	3.61	26	0 30
	2½	5.74	38	0 47
	3	7.54	50	0 62
	3½	9 00	67	0 86
	4	10.66	83	1 00
	4½	12 34	1.00	1 25
	5	14.50	1.10	1 10
	6	18.76	1 50	2 00
	7	23.27	2.00	
	8	28.18	2.75	
	9	33 70	3.70	
	10	40.06	4.75	
	11	45.02	5.75	
	12	49.00	6 50	
	13	54.00	7.75	
	14	58 00	9.00	
	15	.....	10.00	

Discount, (car load lots) butt-welded ⅛ inch to 1½ inches plain.....80 per cent.
Ditto galvanized 20 per cent.
Discounts (car load lots) lap-welded 1½ inches to 15 in. plain.....50 per cent.
Ditto galvanized 35 per cent.
Discounts on pipe cut to specified lengths depends on size and waste.

Among the Blast Furnaces.

The Robesonia furnace, Pittsburgh, has recently been remodeled at an expense of $65,000.

"Bettie Furnace," the first furnace erected in the Great Kanawha Valley, went into blast last November. It cost $225,000 and is owned by the Black Band Iron & Coal Co. Its capacity is 17 tons.

The Roan Iron Co., Chattanooga, Tenn., has two large blast-furnaces at Rockwell station, on the Cincinnati Southern road, which are kept constantly in blast, averaging about 100 tons daily from native ores, with coke for fuel, manufactured in the company's own ovens, from coal mined from the hills alongside of which the furnaces are planted.

Colebrook, Pa., furnaces are keeping up their reputation. In a run of 64 weeks the average yield of stack No. 2 has been 501¼ tons, and since the 1st of January last the average has been a trifle over 543 tons per week. Taking into consideration the fact that all this was done on Cornwall ores, one of the hardest reducing ores known, it must be admitted that these are highly creditable performances.

Some time ago we referred at length to the furnace invented by Dr. Duryea, of New York, for making iron direct from the ore, and stated that the Cambria Iron Company were considering the advisability of building one of them at their works in this place, others to follow soon if it should prove to be all its inventor claims for it. We now learn that the company's experiments with Dr. Duryea's molasses lining for the furnace, which is required to withstand the most intense heat, have been entirely satisfactory, and that the trial furnace is likely to be built.—[Johnstown (Pa.) Tribune.

A correspondent thus writes the Age of Steel, St. Louis: Our stack is 10 foot bosh by 46 foot height, blown by three tuyeres, closed top, bell and hopper, engine capable of delivering 6,000 cubic feet of air per minute at a pressure of six pounds, iron hot-blast stove, capable of heating same amount of air to 850 deg.; fuel—charcoal about one-third hard wood, balance soft; ores—brown hematite yielding uncalcined, abont 42 per cent. metalic iron, 12 per cent. silica and six-tenths of 1 per cent. phosphorus; good gray limestone, carrying 92 per cent. carbonate of lime. How should we fill this furnace preparatory to starting? What number of cubic feet of air should we blow? How rapidly add to the burden of ore? and what percentage of lime should we carry? Would it be advantageous to calcine the ore, and if so, by what process? What amount iron should this size stack produce per day with the equipment and stack described?

Electric Lighting in Foundries.

Hardware Trade Journal, Birmingham, Eng

Messrs. Pollit and Wiggett, engineers, of Sowerby Bridge, have recently adopted the electric light in their works. They have had the Crompton-Burgin machine and five D D lamps put up, three of which are placed in the foundry and the other two in the erecting and heavy tool shop respectively. The two last-named were only intended to give a general light in each shop, but this light is so powerful, and burns so steadily, that but very few gas lights have to be used. Hitherto it has not been deemed advisable to burn less than two arc lamps on account of the shadows, but Mr. Hartnell, of Leeds, who carried out the work, has given practical proof that for general purposes one lamp only is needed.

THE effect of a safety-valve in the lower part of the boiler has been tested in England. A boiler was prepared with the ordinary safety-valve and an additional one attached to the lower part, both equally secured. Heated to redness, the boiler had cold water pumped into it and in half a minute a pressure of between 50 and 60 pounds was produced. The lower safety valve was the first to act, giving entire satisfaction to the experimenters.

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CHAS. J. COOCH,

SOLICITOR OF PATENTS, COUNSELLOR AND EXPERT, St. Cloud Building, Washington, D. C. 20 years' practice. Daily attendance in Patent Office. Reliable. Fair charges. Prompt personal attention given each case. Good references. Advice free. 1

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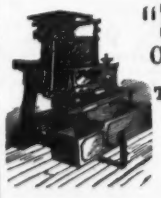

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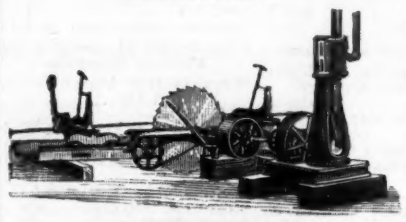

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Engine Lathes

Lowell, Mass. 3

TRAVELER'S REGISTER.

Lake Shore & Michigan Southern.

The time given is the new standard (Ninetieth meridian) time, which is thirty-three (33) minutes slower than Cleveland time.

TRAINS GOING EAST.	Arrive. From West.	Depart. For East.
Fast N. Y. Express	*1 07 a m	*1 22 a m
N.Y.,Bo't'n & At. Ex.	*6 37 a m	*7 02 a m
Elyria Accommodation	†8 07 a m	.....
Pt.Clinton Accomd'at'n	†10 37 a m	.....
Buffalo Accommodation	†10 37 a m	†10 52 a m
N. Y and B't'n Fast Ex.	*1 57 p m	*2 27 p m
Cincinnati and St Louis Ex	.....	3 27 p m
Conneaut Accom'dation	.....	†4 22 p m
Night Exp via Norwalk	† 9 42 p m	†10 07 p m
Night Exp via San'sky	9 44 p m	.....

TRAINS GOING WEST.	Arrive. From East.	Depart. For West.
Fast Limited Express	*11 55 a m	*12 05 a m
Mich. Ex. via Sandusky	*2 22 a m	*2 37 a m
Chi. Ex. via Sandusky	†6 07 a m	6 32 a m
Mich. Ac. via Norwalk	.....	†6 12 a m
Conneaut Accom'dat'n	†8 12 a m	.....
Toledo Ex. via Norwalk	†12 52 p m	†3 02 p m
St. Louis Ex. via San'ky	*1 02 p m	*1 25 p m
Chi. Pac.Ex. via Nor'lk	*6 02 p m	*6 32 p m
Pt.Clinton Accom'dat'n	.....	†4 32 p m

Sunday trains for Nottingham—Depart 8:32 a. m. and 1:47 p. m., return at 9:37 a. m. and 4:17 p. m.

Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

Cleveland, Columbus Cincinnati & Indianapolis.

Central standard time, 33 minutes slower than Cleveland time.

ARRIVALS.	
No. 2 Col. & Cin. & Ind'polis Ex.	*6 45 A.M
No. 8 C. L. & W. and Galion Exp	9 10
No. 12 St. Louis & New York Exp.	*2 50 P.M
No. 6 Indianapolis & Columbus Exp	9 55
No. 4 Columbus & Cincinnati Exp.	*3 20
No. 10 Wheeling Express	6 45
No. 14 Cincin New York fast line,	1 10 A.M
DEPARTURES.	
No. 1 Cincinnati & Columbus Exp.	*7 30 A.M
No. 11 Cleve, Indianap. & Wheel'g Ex	6 40
No. 3 Special St. Louis & Cin. Ex.	**1 40 P.M
No. 5 Night Express,	*6 40
No. 7 C. L. & W. and Galion Exp	4 30
No. 17 Spec. Col. Cin'ti. Exp.	1 20

**This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland & Pittsburgh.

The time given is the central standard time, thirty-three minutes slower than Cleveland time.

	DEPART	ARRIVE
Pittsburg & Wheeling	8 00 A.M	2 12 P.M
Express	2 00 P.M	6 25
Alliance Accommodation	3 15	9 50 A.M
Ravenna Accommoda	4 50	8 12
Night Express	†11 10 P.M	5 55 A.M
Newburg Accom'dation	10 30 A.M	11 40
Newburg Accom'dation	12 00 M.	1 20 P.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance. All other trains daily except Sunday.

"The Nickel Plate."

Ninetieth meridian time.

Going East.	ARRIVE.	DEPART
Buffalo Accom.	10 22 a.m.	10 27 a.m.
Conneaut Accom		3 52 p.m.
Chicago Accom	9 02 p.m.	
Local Freight	11 36 p.m.	12 17 p.m.
Going West.	ARRIVE.	DEPART
Chicago Accom		6 47 a.m.
Conneaut Accom	8 57 a.m.	
Bellevue Accom	4 52 p.m.	4 57 p.m.
Local Freight	12 44 p.m.	1 22 p.m.

Rocky River Accommodation departs 5 52 a.m.; 1 47 p.m.

Euclid Accommodation departs 7 02 a.m.; 11 42 p.m., 5 17 p.m,

All trains daily except Sunday.

New York, Pennsylvania & Ohio.

New standard central, or Ninetieth meridian time, 33 minutes slower than Cleveland city time.

DEPARTURES.	a.m.	p.m.
N. Y. & Pitts. Express	* 6 50	11 00
Youngstown & Pitts. Ac	10 35	....
Fast N. Y. & Pitts. Express	....	* 2 20
Mahoning Accommodation	....	4 10
N. Y. and Pitts. Express	....	11 00
ARRIVALS.	a.m	p.m.
New York Express	* 6 15	....
Mahoning Valley Ac.	10 20	....
Fast N. Y. & Pitts. Ex	....	* 1 05
N. Y. & Pittsburgh Ex	....	* 6 30
Youngstown & Pitts. Ac.	....	9 45

* Sunday trains.

Valley Railway.

Central Standard time.

	ARRIVE.	DEPART
Wheeling Junction	9 47 A.M	8 02 A.M
Canton	1 07 P.M	5 47 P.M
Wheeling Junction	5 47 P.M	2 52 P.M

Special trains leave on Sunday at 3.50 P.M., arriving at Cleveland at 6.42 P. M.

Depot foot of South Water Street.

Connotton Valley Railway.

Standard Time.

Trains arrive:	A. M.	P. M.
Canton, Sherrodsville & Coshc'ton	9 47	7 07
Canton & Coshocton		1 02
Kent accommodation	7 37	

Newburgh 7:02 a. m., 8:32 a. m. 1:52 p. m., 4:17 p.m., 6:42 p. m., 10:07 p.m.

Trains leave Cleveland,	A. M.	P. M.
Canton, Coshocton & Sherrodsville	7 02	
Canton & Sherrodsville		2 07
Canton & Coshocton	7 02	3 42
Kent accommodation		5 12

Cleveland and Newburgh, 6:12 a. m., 7:47 a.m., 10:32 a.m., 2:52 p.m., 5:52 p.m., 5:12 p.m. Newburgh and Bedford 10:32 p.m.

Trains Sunday only depart for Bedford 8:07 p.m., 10:07 a.m., 9:02 p.m.; Newburgh, 1:43 p m.; Kent Accommodation 5:12 p.m.

Trains arrive, Kent Accommodation 7:37 p.m. Bedford 8:46 p.m., 1:27 p.m., 5:55 p.m.; Newburgh 2:32.

Depot corner Huron and Ontario streets.

Cleveland, Akron & Columbus Railroad.

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Railroad to Hudson, for Akron, Columbus, etc.

	ARRIVE.	DEPART.
Mail	2 30 P.M	8 26 A.M
Express	7 30	2 00 P.M
Accommodation	10 10 A.M	2 45 P.M

Cleveland, Lorain & Wheeling.

ARRIVALS.	
Wheeling & Cleveland Express	7 15 P.M
Uhrichsville Express	9 30 A.M
DEPARTURES.	
Wheeling & Cleveland Express	7 10 A.M
Uhrichsville Express	5 00 P.M

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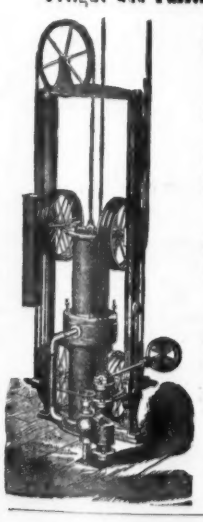

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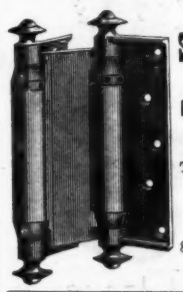

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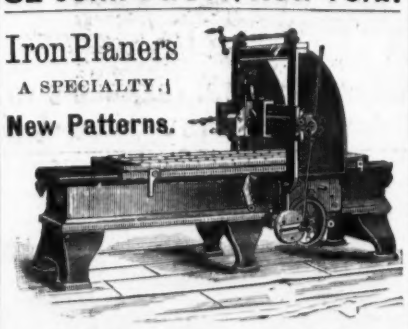

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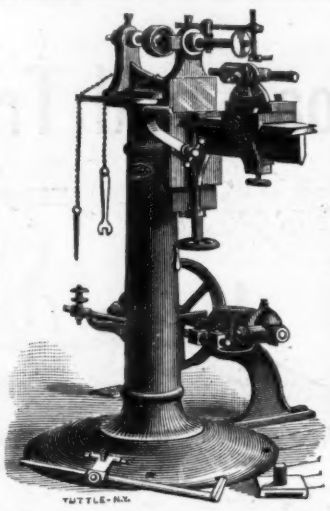

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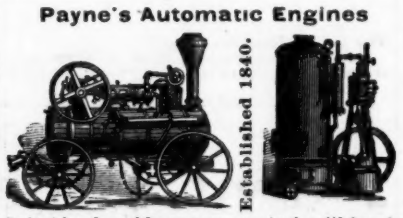

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The Cleveland, Mt. Vernon and Delaware RAILROAD.

"Cleveland, Akron & Columbus."

In effect November 18, 1883, based on Central Standard Time.

GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.	No. 7.
Leave Columbus	6 45	11 40	.....	16 50
Westerville	7 10	12 05	.....	17 18
Centerburg	7 52	12 47	.....	18 04
Mt. Vernon	8 37 B	13 31 D	.....	18 50 S
Gambier	8 49	13 41	.....	19 01
Danville	9 09	14 01	.....	19 23
Gann	9 21	14 11	.....	19 35
Millersburg	10 14	14 59	5 30am	.....
Fredricksb'g	10 37	15 19	5 51	.....
Orrville	11 12	15 50	6 50 B	.....
Warwick	11 36	16 11	7 16	.....
Clinton	11 42	16 16	7 23	.....
Akron	12 15	16 46	7 57	.....
C'yahoga F's	12 30	16 58	8 11	.....
Hudson	12 50	17 15	8 30	.....
Ar. Clevel'd	14 12	18 25	9 50	.....

GOING SOUTH

	No. 2	No. 4.	No. 6.	No. 10.
Leave.				
Cleveland	8 00	14 00	15 15	16 50
Hudson	9 17	15 10	16 30	18 15
Cuyahoga F's.	9 35	15 28	16 54	18 50
Akron	9 51	15 44	17 11	19 45
Clinton	10 22	16 16	17 43	.....
Warwick	10 26	16 21	17 48	.....
Orrville	10 51	16 47	18 14	.....
Fredricksburg	11 22	17 18	18 48	.....
Millersburg	11 45	17 40	19 10	No. 8.
Gann	12 32	18 30	.....	5 50
Danville	12 44	18 41	.....	6 0(
Gambier	13 04	19 01	.....	6 21
Mt. Vernon	13 29 D	19 26 S	.....	6 50 B
Centerburg	14 01	20 00	.....	7 25
Westerville	14 45	20 45	.....	8 13
Columbus arr.	15 10	21 10	.....	8 40

The system used in the above table consists in avoiding the confusing division of the day into two equal portions of 12 hours each, and employing instead a continuous count from 1 to 24. The days begins at Midnight, as under the common system, but there is no possibility of confusion between the forenoon and afternoon hours.

E. T. AFFLECK,
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Central or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct as follows:

6 50A.M. LIGHTNINGEXPRESS(daily sleepingand hotel coaches from Leavittsburg 8:35 a.m. To New York, Albany and Boston without change. Arrives at Meadville 10:40 a.m., (dinner); Franklin, 12:08 p.m. Oil City, 12:30 p.m.; Corry, 12: 5 p.m.; Jamestown, (Lake Chatauqua) 1:35 p.m.; Buffalo, 5:50 p.m.; Rochester, 8:20 p.m.; Hornellsville, 6:00 p.m.; (supper); Corning, 7:25 p.m.; Elmira, 8:05 p.m.; Binghampton, 10:05 p.m.; Albany, 5:00 a.m.; Boston, 1:45 p.m.; arriving at New York, 6:15 a.m.

2:20P.M. LIMITED EXPRESS, Pull-Sleeper Cleveland to New York, (daily). Arrives at Meadville, 6:30 p m.; Jamestown, 8;47 p. m.; Salamanca, 9:45 p. m.; New York, 10:10 a. m.

11:00 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsurg to New York without change. Arrives at Youngstown, 1:50 a.m.; Pittsburgh, 5:50 a. m.; Washington 0:00 a. m. Baltimore 00:00 p. m.; Meadville, 3:25 a. m. Corry, 4:50 a.m.; Jamestown, 5:57 a.m.; Buffalo, 9:20 a.m.; Rochester, 12:58 p. m.; Hornellsville 11:00 a.m.; Corning, 12:07 p. m.; Elmira 12:40 p. m.; Binghampton, 2:19 p.m.; New York 9:10 p.m.

2:20 P.M. PITTSBURGH EXPRESS, daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:02 p.m.; Washington, 7:09 a.m.; Baltimore, 8:19 a.m

4:10 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 6:55 p.m; Sharon, 8:01 p.m; Sharpsville 8:10 p. m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 00:00 p. m.

6:50 A.M. PITTSBURGH EXPRESS, —(daily) through without change. Arrives at Youngstown, 9:30 a.m.; Sharon, 10:30 a.m.; Sharpsville, 10:40 a.m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:15 a.m., 7:45 a.m., and 12:55 p.m. and 3:45 p.m.

10:35 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:30 p.m.; Pittsburgh, 5:45 p.m. Trains arrive at Cleveland, 6:15 a.m., 6:30 p.m., 10:30 a.m 1:05 p.m., and 9:45 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

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Gen. Pa Agt., Cleveland, Ohio.
M. L. FOUTS,
J. M. FERRIS, 1 ass. Agt., 131 Bank st.,
Gen. Man'gr, Cleveland. Cleveland.

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The passenger equipment of new trunk line is all new and is supplied with the latest appliances necessary to safe, speedy and comfortable travel.

At Chicago, Passenger Trains arrive at and leave Union Depot, Van Buren street.

Following is the time in effect Nov. 18, 1883, and until further notice:

GOING EAST.

	Local Pass'n'gr	Local Pass'ngr.	Conneaut, Accom,
Lv. Chicago	7 47 am	.....	.....
Ar. Valparaiso	9 37	.....	.....
" Ft. Wayne	1 00 pm	.....	.....
" New Haven	1 35	.....	.....
" West Leipsic	3 45	.....	.....
" Arcadia	4 44	.....	.....
" Fostoria	4 57	.....	.....
" Gr. Springs	5 44	.....	.....
" Bellevue	6 12	.....	.....
Lv Bellevue	6 22	7 52 am	.....
Ar Lorain	7 50	9 16	.....
Ar Cleveland	9 02 pm	10 22	.....
Lv Cleveland	.....	10 27	3 52 pm
Ar Painesville	.....	11 33	5 05
" Ashtabula	.....	12 25 pm	6 03
" Conneaut	.....	1 07	6 32
" Erie	.....	2 09	.....
" Dunkirk	.....	3 47	.....
" Buffalo	.....	5 22	.....

GOING WEST.

	Local Passn'gr.	Local Pass'ngr.	Con'eaut Accom.
Lv Buffalo	.....	9 47 am	.....
Ar Dunkirk	.....	11 24	.....
" Erie	.....	1 33 pm	Leave.
" Conneaut	.....	2 17	6 17 am
" Ashtabula	.....	2 50	6 46
" Painesville	.....	3 44	7 43
" Cleveland	.....	4 52	8 57
Lv Cleveland	6 47 am	4 57	.....
Ar Lorain	7 53	6 12	.....
Ar Bellevue	9 17	7 37	.....
Lv Bellevue	9 22	.....	.....
Ar Gr. Springs	9 44	.....	.....
" Fostoria	10 22	.....	.....
" Arcadia	10 34	.....	.....
" West Leipsic	11 30	.....	.....
" New Haven	1 35 pm	.....	.....
" Ft Wayne	1 52	.....	.....
" Valparaiso	5 55	.....	.....
" Chicago	7 52	.....	.....

Trains run by Ninetie7h meridian time, which is nine minutes slower than Chicago time, twenty-eight minutes slower than Columbus time, thirty-three minutes slower than Cleveland time, forty-four minutes slower than Buffalo city time, and sixty minutes slower than Seventy-fifth meridian time.

For information, call on nearest Agent of the Company or address

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A. J. Smith, Gen'l Pass. Agent, CLEVELAND, O

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AND FAST CUTTING.

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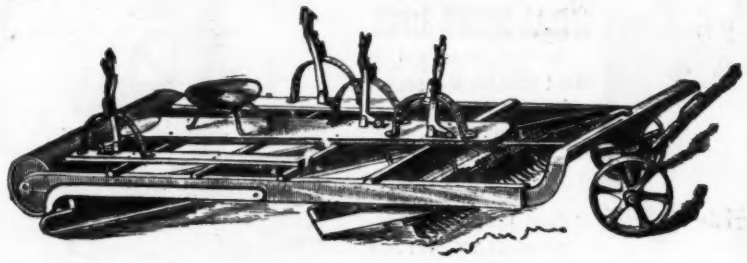

CITY SURVEYOR'S OFFICE,

LANSING, MICH., May 3, 1883.

The Griffin Road Machine Co.

Gents.--We have had your machine running for a month, and are highly pleased with it. It has already more than paid for itself by the saving of labor. H. D. BARTHOLOMEW,
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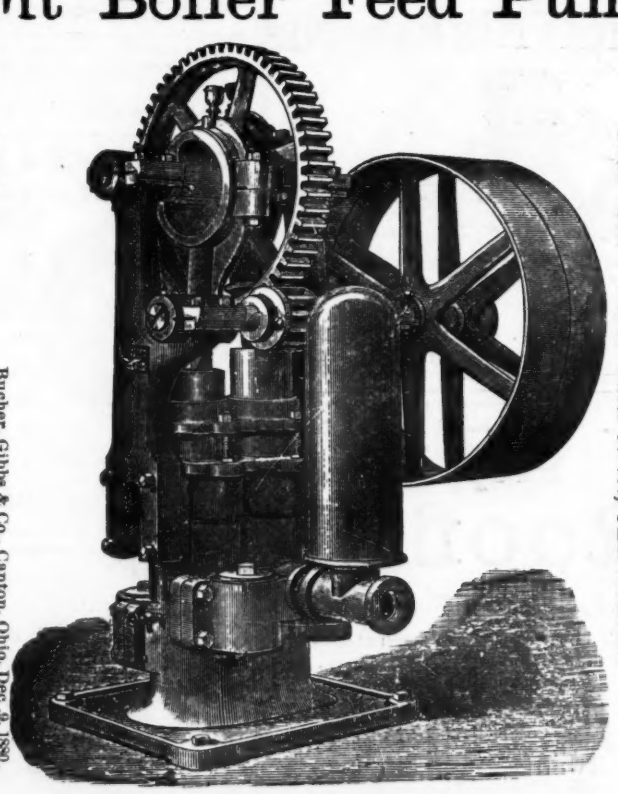
Respectfully,
BUCHER, GIBBS & CO.
per Gibbs.



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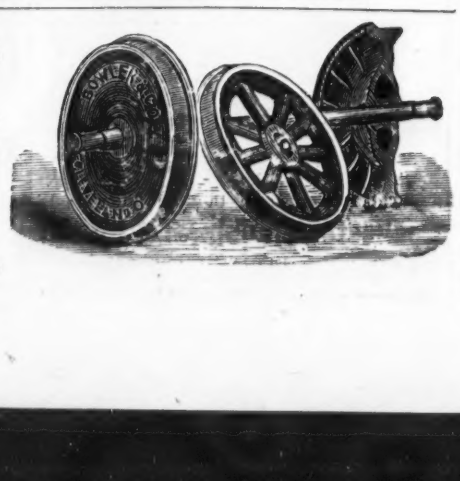

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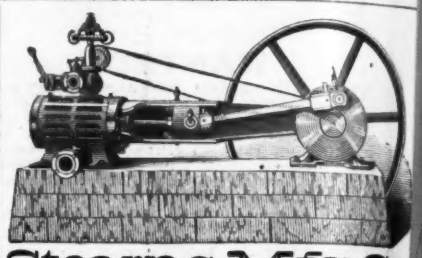

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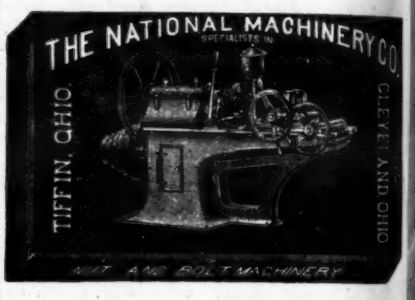

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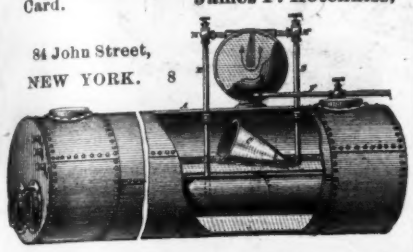

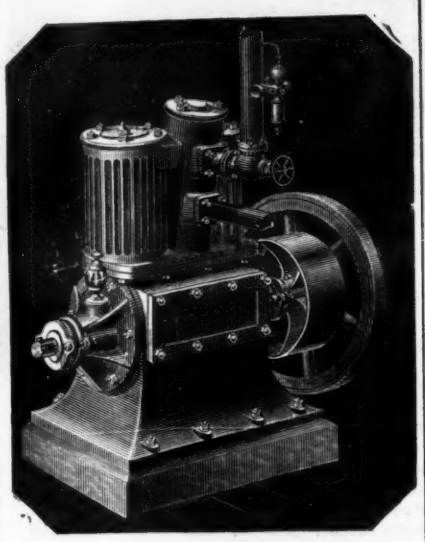

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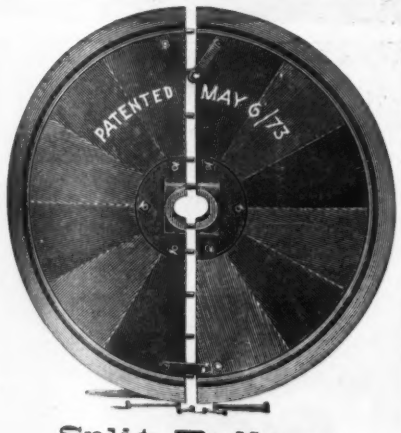

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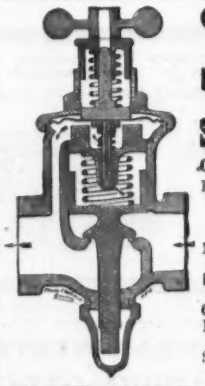

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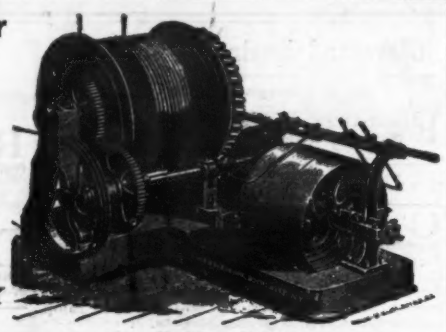

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Send for our Catalogue.

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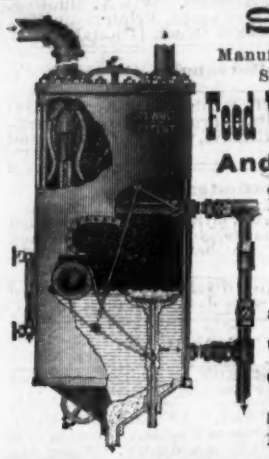

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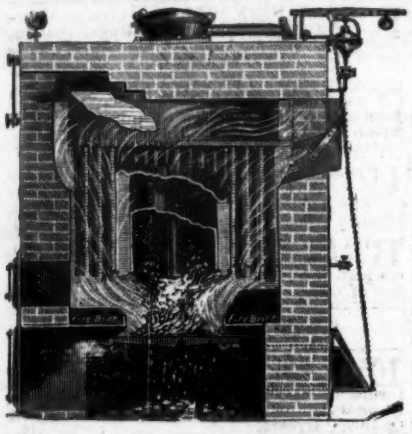

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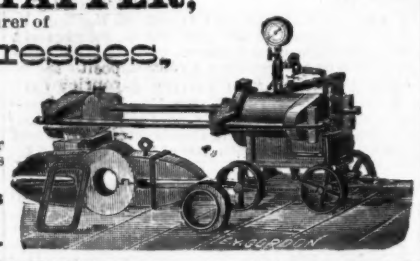

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OVEN NO. 8—20x21¼x13 Inches. OVEN NO. 9—22x23¼x14 Inches.

Has peculiar and important features that make it the best operating stove in the market, and commend it to the favorable notice of dealers who desire a first class stove.

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The fire-back is in three heavy interchangeable pieces. A water-back is provided which occupies the same space as fire-back, heats perfectly and does not retard the heating of oven, for reasons of the intervening flue between it and oven.

The grate is hinged at its extreme back edge, and when dumped gives a clear opening into a large ash-pan. It can be partially dropped to remove clinkers from the front.

A receptacle for the covers, when removed from top of stove, is hung on swing bracket under front hearth.

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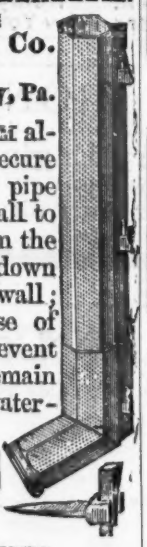

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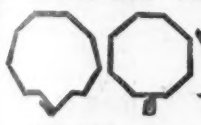

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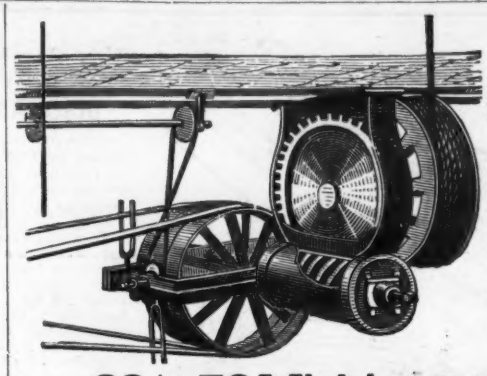

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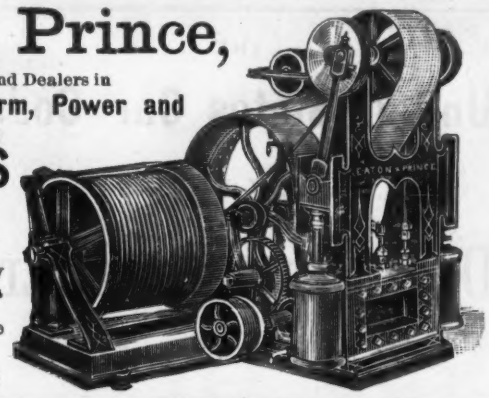

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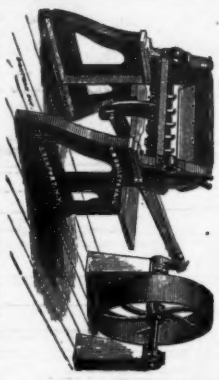

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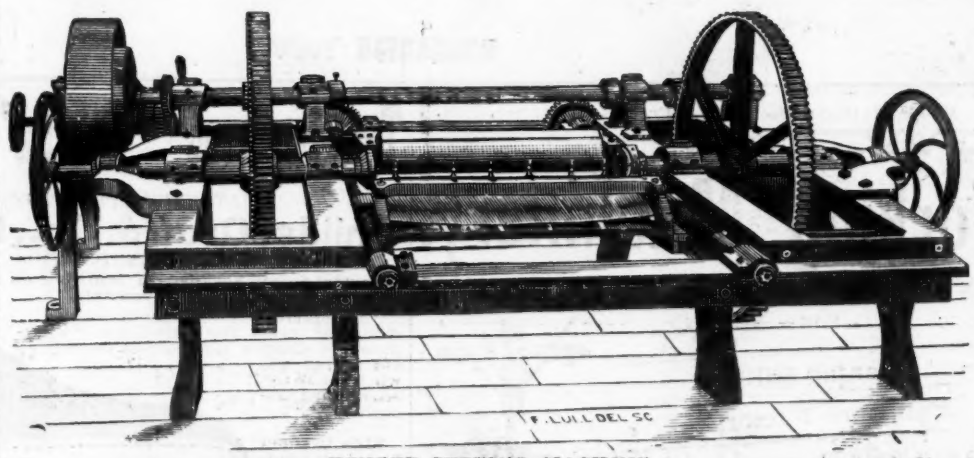

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34

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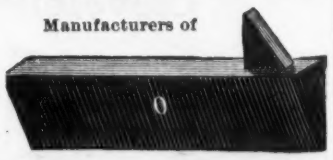

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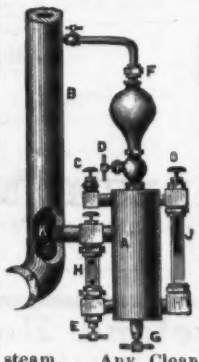

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LUBRICATOR CUPS.

For oiling valves and cylinders of steam engines, by the only perfect method, through the steam pipe. The oil passes in sight, drop by drop, into the column of steam where it vaporizes, thus becoming a STEAM LUBRICANT, oiling perfectly every part reached by the steam. Any Clean Oil, black or white, light or heavy, may be used. Saves from 50 to 90 per cent. in oil and wear of machinery, thus paying for itself several times a year. A cup will be sent to responsible parties on twenty days' trial if desired. In ordering give diameter of cylinder.

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Dump and Coal Car.

(M. VAN WORMER'S PATENTS.)

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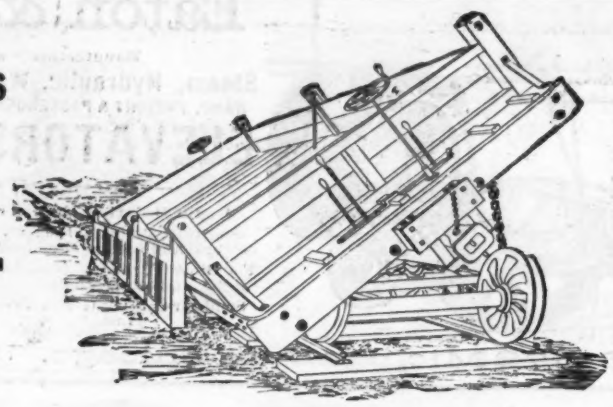

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This Car has a capacity of 18 to 20 tons,
AND CAN BE HANDLED BY ONE MAN,

DISCHARGING ITS LOAD INSTANTLY.

The device can be applied to flat cars. The car is under perfect control at all times, and can be held at any elevation or dumped suddenly if desired. For construction trains, cars with this device would be invaluable

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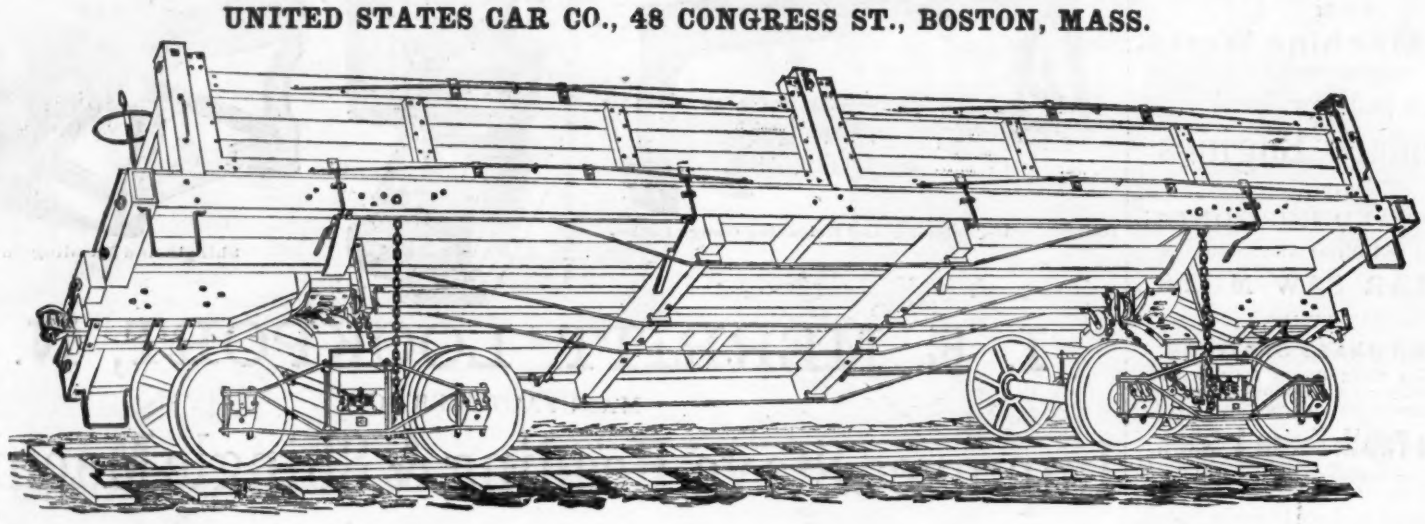

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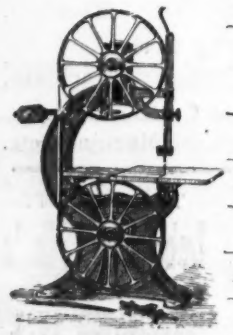

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"A" represents the Creeper in position ready for use. The dotted line "B" shows the Creeper thrown back entirely out of the way when not in use, or walking in-doors.

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Its simplicity of construction, being easily adjusted, always ready for use, and when not needed can be instantly turned under the "Shank" out of the way, therefore not interfering with walking in the house on carpets, etc. When in position for walking on ice it is a sure protection from falling.

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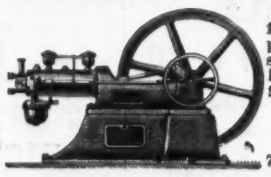
No explosions; no fires nor cinders; no gauges; no pumps; no engineer or other attendant while running. 61



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Furnished both Dry and Ground in Oil.

Used by nearly all the Railroads. 63

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Hardware, Iron, Nails AND Metals

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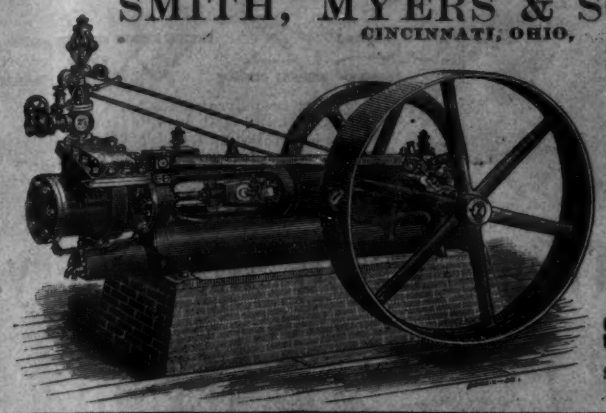

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3		3	3	415 00
4	4		4	565 00
4		6	4	565 00
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BOILER, TANK, BRIDGE AND TRACK BOLTS.

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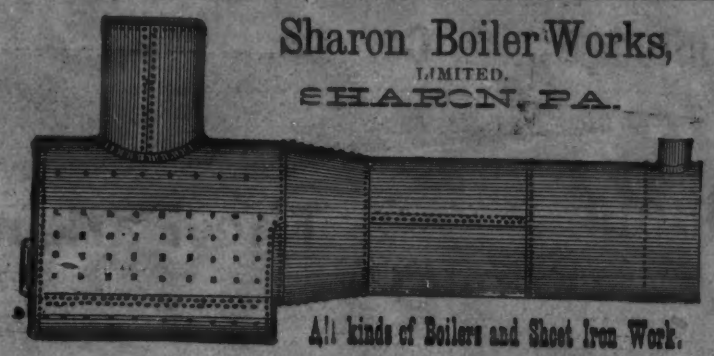

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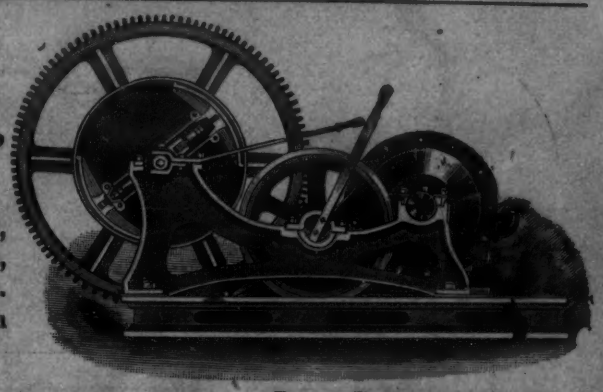
Hoisting Machinery, Stationary Engines, High Speed Engines.

For Specialties Send for Circulars. 68



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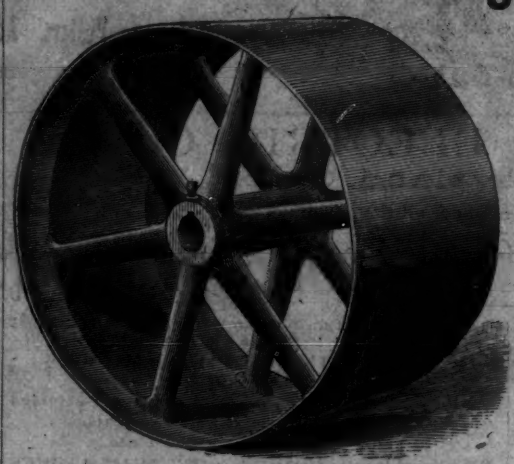

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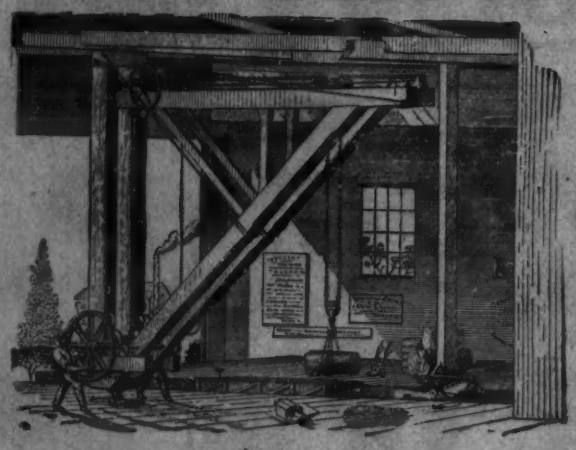

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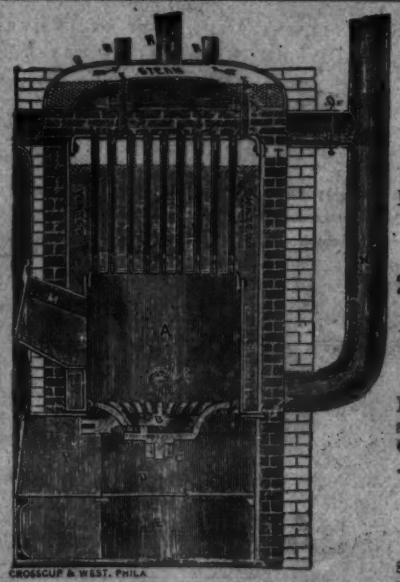

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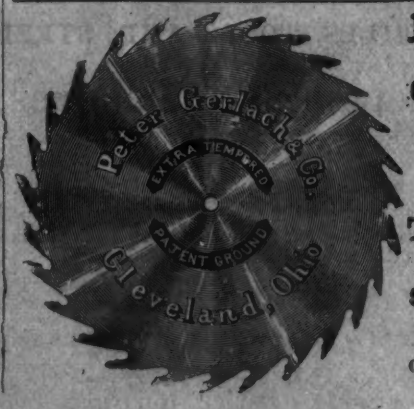

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